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RESEARCH PROGRAM on the
TRAINING OF SKILLED MANPOWER

A SECOND SURVEY OF ELECTRONIC DATA PROCESSING IN CANADA 1962

REPORT No.9C
OCTOBER 1963

DEPARTMENT OF LABOUR

Reports Issued by The Interdepartmental Skilled Manpower Training Research Committee

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RESEARCH PROGRAM

on the

TRAINING OF SKILLED MANPOWER

A SECOND SURVEY OF ELECTRONIC DATA PROCESSING IN CANADA 1962

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PREFACE

This report is one of a series of studies carried out under the Skilled Manpower Training Research Program initiated by the federal Department of Labour in 1956, in co-operation with other interested federal and provincial departments and management and union organizations. The research program is under the general direction of the Interdepartmental Skilled Manpower Training Research Committee and its aims and objectives are set out in detail in Report No. 1 of this series, entitled 'Progress Report' issued in June, 1957.

An important phase of the Skilled Manpower Training Research Program has been the study of technological changes in selected industries and their effects on manpower and training requirements. In this phase of the program, the Committee has been greatly assisted by the tripartite Advisory Committee on Technological Change, which was set up in 1957.

In the summer of 1958 a decision was made to explore the area of office mechanization and automation. Accordingly, a case study was initiated on the impact of the introduction of electronic data processing (E.D.P.) in a large Canadian office organization. This study is continuing and will be reported on as soon as the collection of post-change data has been completed and analyzed. An interim report based on data from the case study was issued as Report No. 9B 'Electronic Data Processing Occupations in a Large Insurance Company' (1961).

Meanwhile, it had become clear that a more general assessment of the status of technological change in Canadian offices was desirable. Although the impact of office mechanization in all its forms, and of organizational and systems changes, on clerical, white collar, supervisory and management occupations is the full area requiring investigation, it was decided to concentrate limited research resources on a study of electronic data processing, the most recent but potentially most far reaching of all the changes that are taking place in the office environment.

In 1960 an initial survey was administered by a mailed questionnaire which included all known Canadian E.D.P. users. The survey was designed to accumulate factual information on the number and types of computers in use, the sorts and sizes of organizations employing computers, the different kinds of work being done by this equipment, and the number of people employed in the various new occupations created by the new systems and equipment. A report on the results of this survey was published as Report No. 9A 'The Current Status of Electronic Data Processing in Canada' (1960).

The present report is the result of a second mailed survey conducted two and a half years later. Included in the survey are all the digital computer installations known to have been operating in Canada at July 1, 1962. Most of the information solicited parallels the data collected in 1960 in order that the volume and nature of growth in this field could be ascertained. In addition, however, somewhat more detailed information was collected on E.D.P. manpower and new sections have been added on computer personnel shortages and on wage and salary information in electronic data processing occupations.

This report was prepared by Dr. John C. McDonald with the assistance of Miss Helen Traynor and Mr. Ralph Davidson. The study was carried out under the general direction of Mr. P. Cohen. Mr. R. Gaudreau's assistance in the Chapter relating to the salaries of E.D.P. personnel is acknowledged with thanks. The report was prepared for publication by Mr. H. Dodds. The co-operation and generous assistance received from the representatives of the computer manufacturing and distributing firms and from the officials of the user organizations are also gratefully acknowledged.

J.P. FRANCIS,
Director, Economics and Research Branch,
Department of Labour

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SUMMARY

1. There were 303 electronic digital computers operating in Canada at July 1, 1962, consisting of 23 large-scale installations, 239 medium-sized, and 41 small computers. Two and a half years earlier, at January 1, 1960, there were 89 computers in operation. The number of Canadian computer installations had more than trebled in two and a half years.

2. The most rapid growth has taken place among the medium-sized computers-four times as many in operation at July 1, 1962 as at January 1, 1960. The number of large-scale computers has increased two and one-half times and the small-scale machines have doubled their number.

3.. Three-quarters of the total number of computers (235) were located in the provinces of Ontario and Quebec. Almost half the total number (143) were installed in the two cities of Toronto and Montreal. Three-quarters of the total number of computers were located in ten Canadian cities.

4. Manufacturing, with 98 computers, had the largest number of any major industry group. Finance and Insurance, however, with eight large-scale installations continued to have more computer capacity than any other industry group.

5. The 303 computers were distributed among 184 different organizations and were located at 239 different establishments.

6. Two hundred and seventy-six computers on which data were available accounted for 16,541 hours' use (average) per week-approximately 60 hours per computer per week, or an average utilization of one and one-half shifts. Almost three-quarters of 15,997 computer hours used by the owners and operators of computers for their own applications were found to be devoted to commercial data processing and one-quarter to scientific and engineering computations. Since many of the smaller computers were being used for scientific work, while a high proportion of the large computers concentrated on business-type data processing, just about four-fifths of computer capacity was found to be used for commercial data processing.

7. Of total computer time devoted to commercial data processing, approximately three-quarters was accounted for by accounts receivable, accounts payable, customer billing, general, budget and cost accounting, financial analysis and statistics, payroll, and inventory control.

8. Sixty-three computers on which data were available, were utilized by 215 outside users for an additional 634 hours (average) per week. This use of computers by other organizations accounted for only 3.8 per cent of total computer utilization, compared with 7.4 per cent in 1960.

9. Slightly more than one-third of 284 computers on which data was available were operated on a regular multiple shift basis, compared with less than one-fifth of the installations in 1960. Twenty-nine per cent of these computers were operated from five and a half to seven days per week.

10. There were 3,437 people employed in full-time E.D.P. jobs at July 1, 1962. This represents an approximate trebling of the 1,216 full-time E.D.P. personnel reported at January 1, 1960. Male employees outnumbered female employees in these positions 4 to 1. An additional 5,107 people were employed in full-time jobs closely associated with electronic data processing, as keypunch and related machine operators, data origination and data control clerks. An additional 4,683 part-time E.D.P. personnel were counted by the survey.

11. Respondents reported a total of 257 shortages of full-time E.D.P. personnel, representing approximately 7 per cent of the total number of full-time E.D.P. positions. This figure is believed to seriously understate the number of vacancies and opportunities that actually existed in E.D.P. work.

12. No attempt has been made through this mailed survey to assess the employment impact of electronic data processing. Approximately 20 per cent (117,121) of the total employment in organizations operating business-type E.D.P. installations was found to be composed of clerical and clerical supervisory personnel. The positions of 11,360 clerical personnel were reported to have been affected to some degree by the introduction of electronic data processing.

CHAPTER I—THE STATUS OF ELECTRONIC DATA PROCESSING IN CANADA, 1962

Growth in the Number of Computers

There were 303 electronic digital computers[1] in operation in Canada at July 1, 1962.

This is more than triple the number of computers that were operating in Canada at January 1, 1960[2]. In other words, the number of computers had grown by almost two and a half times over the two and one-half year period. This represents a rapid annual rate of growth—almost 100 per cent per year.

TABLE 1

Number of Computers in Canada, by Size of Computer, January 1, 1960 and July 1, 1962

Size of Computer	January 1, 1960	July 1, 1962
Large-Scale Computers	9	23
Medium-Scale Computers	60	239
Small-Scale Computers	20	41
Total	**89**	**303**

The growth in the number of computers has not been evenly distributed among the three size categories. The most rapid growth appears to have occurred in the medium-scale computers—four times as many in operation in 1962 as in 1960. The number of large computers has increased two and one-half times, while the small scale machines have only doubled their number. At July 1, 1962, the medium-sized computers made up 79 per cent of the total number of computers in operation.

Nor apparently has the growth in the number of computers been evenly distributed over the years.

TABLE 2

Cumulative Net* Number of Computers in Operation in Canada at July 1, 1962, by Size of Computer

Date	Large	Medium	Small	Total
At January 1, 1957	—	3	1	4
January 1, 1958	—	8	4	12
January 1, 1959	4	22	7	33
January 1, 1960	6	33	19	58
January 1, 1961	10	49	28	87
January 1, 1962	18	160	35	213
July 1, 1962	23	239	41	303

* The 303 computers operating in Canada at July 1, 1962 have been distributed into one-year periods, according to reported installation dates, and the numbers cumulated at yearly intervals.

CHART 1

GROWTH IN THE NUMBER OF COMPUTERS IN CANADA

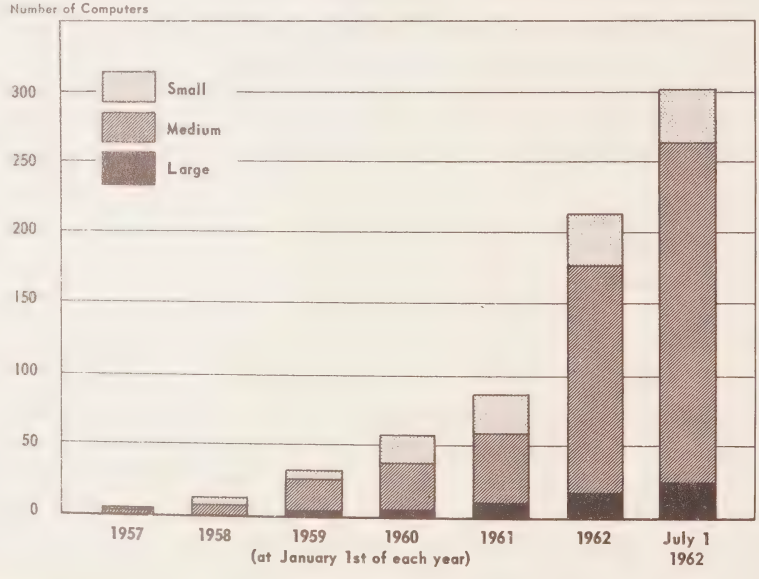


Table 2 appears to suggest that the number of computers installed during 1960 did not grow much more quickly than during the two previous years. It was apparently in 1961 that the dramatic expansion of computer installations took place, and this trend continued at an even higher level during the first six months of 1962. One factor that may have influenced this rapid expansion was the appearance on the market of the medium-scale solid state computer designed particularly for commercial data processing. If the same rate of growth applied in the latter half of 1962, the number of computers operating in Canada at January 1, 1963 would have been approximately 400[3]. However, it should be noted that this table does not tell the whole story. The actual number of computers that have been installed in Canada during the past decade certainly exceeds the figure of 303 computers in current operation at the date of the survey.

Since the survey is conducted to illustrate the situation at a particular point of time, it is not an adequate instrument for following the life history of individual computers. However, it is interesting to note that of the 89 computers operating at January 1, 1960, only 58 of these were in operation at the same locations on July 1, 1962.

Although it cannot be clearly demonstrated from the data, it seems reasonable to infer not only that the cumulative figures obscure a 'wastage' attributable to computer obsolescence but also that a used computer market may be developing.

As organizations that rent computers phase out earlier vacuum tube models and replace this equipment with newer or larger models, incorporating increased speed or capacity, solid state circuitry, and a whole range of new features, the displaced equipment is returned to the manufacturer or distributor. Such equipment may then be reconditioned and installed an the premises of a new customer, perhaps at a reduced rate, or, if it has outlived its usefulness and reliability, the computer may be dismantled and the sound components salvaged. In the one case, such a computer might show up in a subsequent survey as a 'new' installation; in the latter case, it would simply disappear from and reduce the cumulative count.

Some light is thrown on this fast-changing situation by an examination of 19 computers that were known to have been in operation previously but were no longer in operation at July 1, 1962 and hence have not been included in the survey. Fourteen of these computers were still on the premises of the user organizations at July 1, 1962, but questionnaires were not filled out for these because they were either in process of being phased out in favour of new equipment or were no longer in operation. The other five had either been returned to the manufacturer or had been dismantled.

Looking at these 19 computers in terms of their size, 17 were medium-sized vacuum tube machines, 9 of which had been or were being replaced by

medium-scale solid state computers; 5 by large-scale solid state installations; and the other 3 had either been dismantled or were no longer in use. One computer was a medium solid state machine which was in the process of being replaced by a still more up-to-date and more powerful medium-scale computer. And one was a small machine on which the contract had been terminated.

It appeared that a period of several months with both the old and new computers on the premises was normal while the applications were progressively converted to the new equipment.

Geographical Distribution of Computers

As would be expected, the distribution of computers in Canada continued to reflect a heavy concentration in those areas in which business, government and industrial activity is centered.

TABLE 3

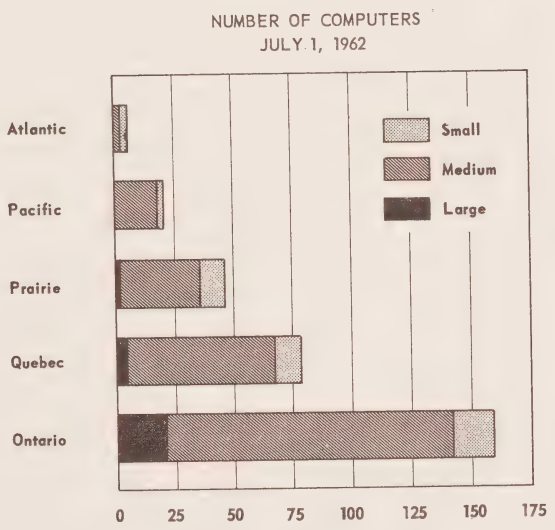
Geographic Distribution of Computers in Canada, by Size, July 1, 1962

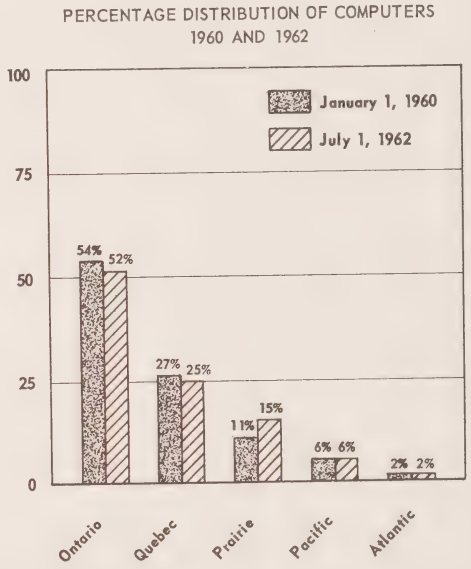
Region	Large	Medium	Small	Total	Percentage of Total Computers	
					July 1, 1962	January 1, 1960
Atlantic	—	2	3	5	2.0	2.0
Quebec	3	63	11	77	25.0	27.0
Ontario	19	123	16	158	52.0	54.0
Prairies	1	33	10	44	15.0	11.0
Pacific	—	18	1	19	6.0	6.0
Total	**23**	**239**	**41**	**303**	**100.0**	**100.0**

This distribution with three-quarters of the computers clustered in the more heavily urbanized and industrialized central provinces simply confirms the pattern portrayed in the earlier report. The only change is that the installation of computers in the Prairie region is taking place at an even faster rate than in the rest of Canada. Fifteen per cent of the total number of computers were located in these three provinces at July 1, 1962 compared with 11 per cent of a much smaller universe at the beginning of 1960. These proportional gains have been at the expense of Ontario and Quebec which have fallen slightly and now represent one-half and one-quarter respectively of the total number of computers.

CHART 2

REGIONAL DISTRIBUTION OF COMPUTERS IN CANADA





This concentration of computer capacity is even more clearly shown by the fact that about half (47%) of the computer installations in the country were located in the two cities of Toronto and Montreal, as had also been the case earlier at the beginning of 1960 (45 per cent).

TABLE 3a

Concentration of Computers in Toronto and Montreal, July 1, 1962

Location	Large	Medium	Small	**Total**	Percentage of Total Computers
Toronto	10	66	4	80	26.0
Montreal	3	53	7	63	21.0
Total	**13**	**119**	**11**	**143**	**47.0**

In view of the large proportion of computers located in Toronto and Montreal, it is not surprising that ten Canadian cities should account for more than three-quarters of the E.D.P. installations in Canada.

TABLE 3b

Concentration of Computers in Ten Canadian Cities, July 1, 1962

City	Large	Medium	Small	**Total**	Percentage of Total Computers
Toronto	10	66	4	80	26.0
Montreal	3	53	7	63	21.0
Ottawa	4	21	3	28	9.0
Vancouver	—	13	—	13	4.0
Winnipeg	—	12	1	13	4.0
Edmonton	1	8	2	11	4.0
Calgary	—	9	2	11	4.0
London	2	5	—	7	2.0
Regina	—	2	3	5	2.0
Hamilton	—	4	—	4	1.0
Total	**20**	**193**	**22**	**235**	**77.0**

Industrial Distribution of Computers

The distribution of computer installations among major industry groups reveals much the same rank order as at the beginning of 1960, with Manufacturing supporting the largest number of installations, followed by Community and Business Services. In the third and fourth rank order positions, Finance and Insurance and Public Administration and Defence have reversed their 1960 relationship.

TABLE 4

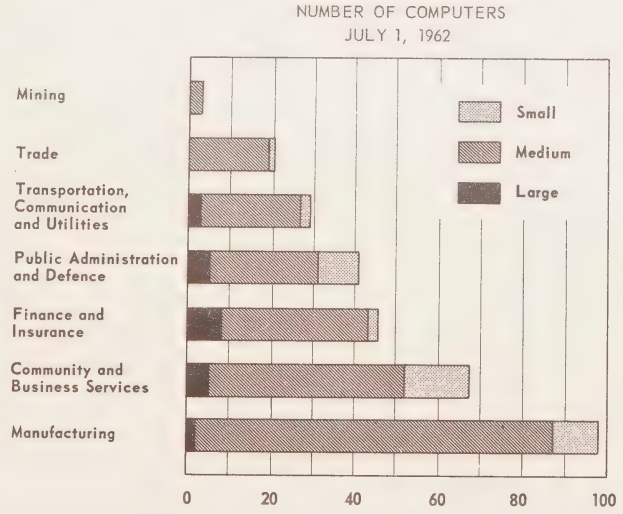
Distribution of Computers by Major Industry Group, and by Size of Computer, in Canada, July 1, 1962, and Percentage Comparisons with January 1, 1960

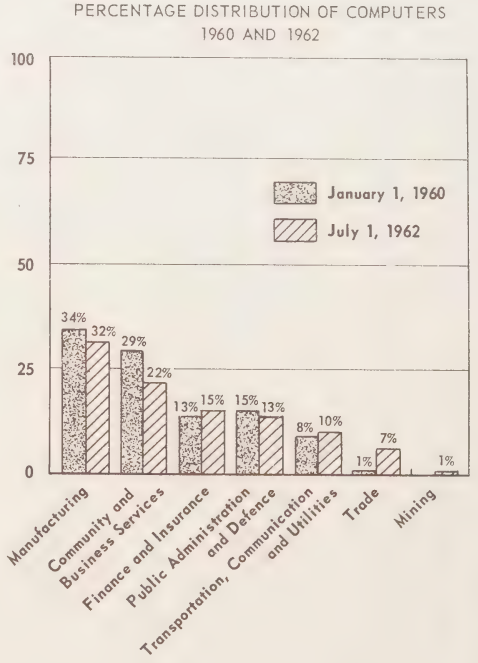
Industry Group	Large	Medium	Small	Total	Percentage of Each Group to Total	
					July 1, 1962	January 1 1960
Manufacturing	2	85	11	98	32.0	34.0
Community and Business Services*	5	47	15	67	22.0	29.0
Finance and Insurance	8	35	2	45	15.0	13.0
Public Administration and Defence†	5	26	10	41	13.0	15.0
Transportation, Communication and Utilities	3	24	2	29	10.0	8.0
Trade	—	19	1	20	7.0	1.0
Mining	—	3	—	3	1.0	—
Total	**23**	**239**	**41**	**303**	**100.0**	**100.0**

***Community and Business Services** — The number of computers classified under this major industry group is slightly inflated. The reason for this is that all the computers operated by the manufacturers and distributors of E.D.P. equipment (29) have been grouped together under this heading. A number of these computers might have been classified under Manufacturing (electrical and electronic products) or under Trade (wholesale machinery and equipment), but the majority were primarily used for commercial service bureau work and there were distinct analytical advantages in treating these computers as a single group.

†See page 11.

CHART 3
INDUSTRIAL DISTRIBUTION OF COMPUTERS IN CANADA





†**Public Administration and Defence** – The number of computers classified under this major industry group may be somewhat deflated. The reason for this is that 20 computers owned or operated by federal or provincial government agencies engaged in Manufacturing, Health Services, Transportation, Electric Power, and Liquor sales have been classified by 'function' rather than by organization. Fifteen of these computers have been classified under Transportation, Communication, and Utilities; 3 under Finance and Insurance; and 1 each under Manufacturing and Trade. All of these computers are medium-scale machines except for 2 large-scale computers classified under Transportation, Communication and Utilities.

A more detailed picture of the industrial distribution of computers in Canada can be seen in the following Table 4a. It shows that there are three groups with more than 20 computers each – the Canadian universities, the insurance companies, and the manufacturers and distributors of E.D.P. equipment themselves. Together they account for more than one-quarter of the total number of computers. There are a number of other groups with from 10 to 20 computers each. These include Food, Beverage and Tobacco; Transportation Equipment; Electrical and Electronic Products; Petroleum and Petroleum Products; Chemical Products; Defence Establishments and Armed Services; Federal Government Departments and Agencies; Provincial Government Departments and Agencies; and the Railway industry. Taken together, these groups with more than 10 computers account for over two-thirds of the total number of computers.

TABLE 4a

Distribution of Computers by Specific Industry, and by Size of Computer, in Canada, July 1, 1962

Industry	Number of Organizations	Number of Establishments	Size of Computer			Total Number of Computers
			Large	Medium	Small	
Manufacturing						
Food, Beverages, Tobacco	9	10	–	7	3	10
Rubber, Leather, Clothing	5	5	–	5	–	5
Pulp, Paper and Wood Products	4	4	–	4	–	4
Metal and Metal Fabricating	5	7	–	6	2	8
Machinery	7	8	–	8	1	9
Transportation Equipment	6	8	1	13	1	15
Electrical and Electronic Products	5	9	–	12	1	13
Petroleum and Petroleum Products	8	16	1	18	–	19
Chemical Products	7	9	–	9	1	10
Miscellaneous	5	5	–	3	2	5

(Continued)

TABLE 4a (Continued)

Distribution of Computers by Specific Industry, and by Size of Computer, in Canada, July 1, 1962

Industry	Number of Organizations	Number of Establishments	Size of Computer			Total Number of Computers
			Large	Medium	Small	
Community and Business Services						
Universities	20	25	1	18	9	28
Other Educational Institutions	3	3	—	2	1	3
Hospitals	1	1	—	—	1	1
Trade and Professional Associations	1	1	—	1	—	1
Engineering and Management Consultants	3	3	1	—	2	3
Manufacturers and Distributors of Computers	9	18	3	25	1	29
Miscellaneous	2	2	—	1	1	2
Finance and Insurance						
Banks	1	1	—	1	—	1
Loan and Finance Companies	2	2	—	1	1	2
Trust Companies	1	1	—	1	—	1
Investment Companies and Stock Brokers	4	4	—	4	—	4
Life Insurance Companies	18	18	8	19	1	28
Hospital and Medical Insurance	4	4	—	5	—	5
Other Insurance: Auto, Fire, Casualty	3	3	—	3	—	3
Miscellaneous	1	1	—	1	—	1
Public Administration and Defence						
Defence Establishments, Armed Forces	1	8	1	5	5	11
Federal Government Departments	4	5	2	5	—	7
Other Federal Government Agencies	2	7	1	6	2	9
Provincial Government Departments	5	6	1	5	2	8
Other Provincial Government Agencies	4	4	—	3	1	4
Municipal Government	2	2	—	2	—	2

TABLE 4a (Concluded)

Distribution of Computers by Specific Industry, and by Size of Computer, in Canada, July 1, 1962

Industry	Number of Organizations	Number of Establishments	Size of Computer			Total Number of Computers
			Large	Medium	Small	
Transportation, Communications and Utilities						
Air	1	2	–	3	–	3
Railway	2	7	2	11	–	13
Bus	1	1	–	1	–	1
Pipeline	2	2	–	1	1	2
Telephone	2	3	–	5	1	6
Electric Power	4	4	1	3	–	4
Trade						
Wholesale Food	4	4	–	3	1	4
Wholesale Machinery and Equipment	1	1	–	1	–	1
Wholesale Miscellaneous	4	4	–	4	–	4
Retail Food	2	2	–	2	–	2
Retail Department Stores	3	3	–	4	–	4
Retail Automotive Products	2	2	–	3	–	3
Retail Miscellaneous	2	2	–	2	–	2
Mining						
Iron Mines	1	1	–	1	–	1
Other Metal Mines	1	1	–	2	–	2
Total All Industries	**184**	**239**	**23**	**239**	**41**	**303**

A truer picture of the way in which computer capacity is distributed among major industrial groups can be shown by taking the size as well as the number of computers into account. On the assumption that the capacities of the large: medium: small computers are related on an approximate 100: 10: 1 ratio[4], the rank order changes with Finance and Insurance moving up to first place because of the larger number of giant computers in operation in that industry. A similar situation obtained at January 1, 1960. With this exception, however, the balance of the rank order established on the basis of number of computers remained undisturbed by weighting.

TABLE 4b

Distribution of Computer Capacity (Weighted) by Major Industry Group, in Canada, July 1, 1962 and January 1, 1960

Industry Group	Estimated Weighted Capacity				
	Size of Computer			July 1, 1962	January 1, 1960
	Large	Medium	Small		
Finance and Insurance	800	350	2	1,152	381
Manufacturing	200	850	11	1,061	363
Community and Business Services	500	470	15	985	350
Public Administration and Defence	500	260	10	770	175
Transportation, Communication and Utilities	300	240	2	542	241*
Trade	—	190	1	191	10
Mining	—	30	—	30	—

*This figure results from combining Transportation (131) and Utilities (110) which were treated as separate categories in the analysis of the 1960 data.

Number of Organizations Using Computers

Comparing this pattern of distribution with that found at January 1, 1960, shows that the ratio of computers per organization has risen from 1.3 to 1.6 and the ratio of computers per establishment from 1.1 to 1.3. This means that the number of new organizations and establishments that are introducing E.D.P. is not increasing at quite as rapid a rate as the number of computers. Part of the explanation for this may lie in the fact that organizations with E.D.P. experience are expanding their E.D.P. capacity or extending their E.D.P. applications at an even faster rate than new organizations are adopting electronic data processing.

The 303 computers of all sizes that were operating in Canada at July 1, 1962 were distributed among 184 different organizations at 239 establishments[5]. One hundred and ninety-four of these establishments had only 1 computer; 31 operated 2 computers each; 9 had 3 computers; and 5 establishments had 4 computers located on their premises.

One hundred and thirty-seven of the organizations were single computer organizations. The largest of the multi-computer organizations operated 14 computers, distributed among 8 different establishments.

TABLE 5

Pattern of Computer Distribution Within Organizations,

in Canada, July 1, 1962

Number of Organizations	Number of Computers at Each Establishment								Total Computers	Total Establishments
	Establishment No. 1	Establishment No. 2	Establishment No. 3	Establishment No. 4	Establishment No. 5	Establishment No. 6	Establishment No. 7	Establishment No. 8		
137	1	–	–	–	–	–	–	–	137	137
16	2	–	–	–	–	–	–	–	32	16
5	3	–	–	–	–	–	–	–	15	15
2	4	–	–	–	–	–	–	–	8	2
3	1	1	–	–	–	–	–	–	6	6
3	2	1	–	–	–	–	–	–	9	6
1	2	2	–	–	–	–	–	–	4	2
1	3	1	–	–	–	–	–	–	4	2
1	3	2	–	–	–	–	–	–	5	2
1	4	1	–	–	–	–	–	–	5	2
5	1	1	1	–	–	–	–	–	15	15
2	2	1	1	–	–	–	–	–	8	6
1	2	2	1	–	–	–	–	–	5	3
1	2	1	1	1	–	–	–	–	5	4
1	3	2	1	1	–	–	–	–	7	4
1	4	1	1	1	1	–	–	–	8	5
1	1	1	1	1	1	1	–	–	6	6
1	2	2	1	1	1	1	1	1	10	8
1	4	3	2	1	1	1	1	1	14	8
184									**303**	**239**

Computers Owned and Computers Leased

Out of a total of 288 computers on which information is available, 89 were owned by the user organizations and 199 were leased from the computer manufacturer or distributor. This pattern according to which over two-thirds of the computers (69 per cent) are rented parallels the situation in 1960 when 70 per cent were found to be leased to the user organizations for a monthly rental fee. The reasons for the prevalence of renting over buying computers are not restricted to a policy preference on the part of several of the larger manufacturers and distributors. From the point of view of the user, while the long-term expenditure may be somewhat higher, the high initial capital outlay is not required, obsolescent equipment can be exchanged for newer models, and hardware, software, systems support, and technical maintenance can all be included in a single convenient package.

In this pattern of owning or renting, however, there are interesting variations by size of computer and by major industrial group.

The predominance of the rental pattern is due to the fact that over three-quarters of the medium-sized computers (which make up 79 per cent of all the computers) were rented. In contrast, almost two-thirds of the smaller numbers of large-scale and small computers were owned by the user organizations.

The distribution between owning and renting among the industry groups is also instructive. All but a handful of the computers in Manufacturing and Trade are operated on a rental basis. As these industries together account for just about 40 per cent of the total computers in operation, this situation plays a large part in accounting for the overall preponderance of the rental pattern. In Public Administration and Defence, over half the computers are owned outright. Apparently, Government Departments and Agencies are inclined to purchase as often as to rent. Almost half the computers in Community and Business Services are also owned. This is explained by the large number of universities which have purchased rather than rented their computers and by the fact that almost half of the computers operated by the manufacturers and distributors themselves are included in this group[6]. In Transportation, Communication and Utilities also, just about half of the computers were owner-operated, suggesting that computer purchase is much more common among organizations such as Railway companies and Hydro Electric utilities than is the case in Manufacturing. Forty per cent of the computers in Finance and Insurance are also owned rather than rented, and it appears to be the larger insurance companies that display a preference for purchase.

TABLE 6

Computers Owned and Leased, by Size of Computer and by Major Industry Group, in Canada, July 1, 1962

Industry Group	Size of Computers						Total Owned	Total Leased	Total Number of Computers
	Large		Medium		Small				
	Owned	Leased	Owned	Leased	Owned	Leased			
Manufacturing	–	2	3	79	2	8	5	89	94
Community and Business Services	2	3	15	29	13	1	30	33	63
Finance and Insurance	6	2	10	23	1	1	17	26	43
Public Administration and Defence	3	2	13	13	7	1	23	16	39
Transportation, Communication and Utilities	3	–	11	13	–	2	14	15	29
Trade	–	–	–	17	–	–	–	17	17
Mining	–	–	–	3	–	–	–	3	3
Total	**14**	**9**	**52**	**177**	**23**	**13**	**89**	**199**	**288**

Number of Computers Operated by Different Sized Organizations

Thirty per cent of the computers operating in Canada at July 1, 1962 were being used by small organizations, 35 per cent by medium-sized organizations, and 35 per cent by large organizations. Two and a half years earlier, the medium-sized organizations had accounted for one-half the smaller number of computers in operation and the large organizations for one-third of the total.

Of the total of 184 organizations using computers at July 1, 1962, 45 per cent were small organizations, 33 per cent medium-sized concerns and 22 per cent were large organizations. At January 1, 1960, medium-sized organizations accounted for half the smaller number of 69 organizations using computers, while the large and small concerns each made up about one-quarter of the population of computer users.

TABLE 7

Distribution of Computers by Size of Organization, and by Size of Computer, in Canada, July 1, 1962

Size of Organization (No. of Employees)	No. of Organizations in Size Category	Large Computers	Medium Computers	Small Computers	Total Computers
Up to 750	82	3	64	23	90
751 – 4,500	61	13	86	7	106
4,501 and over	41	7	89	11	107
Total	**184**	**23**	**239**	**41**	**303**

Footnotes

[1]The operational definition of a computer adopted for the purposes of this research includes criteria of capacity, speed, and price but hinges primarily on some form of 'internal memory'. Thus, the smaller 'electronic calculators' and equipment with 'external programming' have been excluded. The classification of computers according to size has been based on monthly rental charges: Large—$20,000, or more per month; Medium—$1,500 to $20,000; and Small—under $1,500. The number of

computers on the premises of Canadian organizations at July 1, 1962 was actually 317, as there were 14 computers that were either being phased out of operation in favour of more up-to-date replacement equipment or computers that had outlived their usefulness and were not in operation. As our respondents did not fill out questionnaires with respect to these computers, they have been excluded from the main analysis in this report. Of the 303 computers known to have been in operation at the reporting date, completed questionnaires were received for 284. This represents a 94 per cent response rate to the survey. The first chapter of the report is based on the total universe of 303 computers as information was available from other sources on the nature of business and location of the user organization, and on the type of equipment and date of installation. Information in subsequent chapters on utilization, computer personnel, and wages and salaries is usually limited to the 284 computer installations on which questionnaire data has been provided. The 19 computers on which questionnaires were not returned comprised 14 medium-sized computers and 5 small machines. Eight were located in Ontario, 5 in Quebec, 3 in the Prairies, 2 on the West Coast, and 1 in the Atlantic Provinces. Four were located in manufacturing enterprises, 8 in community and business services, 3 in in trade, and 2 each in public administration and defence, and finance and insurance. Nine of the computers were used for business data processing, 8 for scientific work, and 2 were mixed installations, used for both purposes. Eight of these computers had been installed in the first six months of 1962, 6 during 1961, 2 each in 1960 and 1959, and 1 in 1958.

[2]Cf: Department of Labour, Economics and Research Branch. Skilled Manpower Training Research Series Report No. 9A, *The Current Status of Electronic Data Processing in Canada, (1960).* Ottawa, 1961. 33 pp.

[3]However rapid the growth of computer installations in Canada may appear, it is a relatively modest picture when compared to the situation in the United States. The January 1963 issue of *Business Automation* lists the number of computer installations operating in the U.S.A. at January 1, 1963 as 13,506, and estimates that by January 1, 1964 this figure will reach 20,000. The 13,506 computers comprise 3,715 small computers; 8,631 medium-sized machines, and 1,160 large-scale computers. If 2,800 'calculators' are deducted from the small-scale category as failing to meet the definitional requirements of a computer as used in this report, the January 1963 figure would be reduced to 10,706. After adjusting for the difference in the size of the population and market of the two countries by employing the approximate ratio of 1:10, it is clear that at January 1, 1963 there would have been proportionally more than two and a half times as many computers operating in the United States as in Canada. There are a number of factors that may help to explain this. There are proportionally fewer very large firms in Canada which may feel that they can afford the high purchase price (or monthly rental) of the large-scale computers. As clerical salary costs are generally lower in Canada than in the United States, the potential salary savings represented by computers may have less appeal for Canadian customers. The purchase and rental prices of computers imported for Canadian customers are generally higher than the prices that obtain in the United States because of the tariff policy on computers and computer components. Many American organizations with Canadian subsidiaries may tend to centralize their computing facilities, both for data processing and scientific work, at parent plants or head offices in the United States. Finally, there appears to have been proportionally less financial encouragement by government in this country directed toward the design, production and marketing of a domestic computer product compared with Sweden, the United Kingdom, France, Japan, etc., as well as the United States and the U.S.S.R.

[4]These ratios should not be interpreted as precise relationships between the *real* capacities of the three size categories of computers, but rather simply as a device to illustrate the point that number of computers alone is not a reliable guide to the assessment of computational capacity. Other ratios suggested included 30:3:1 and 25:5:1, but there was no concensus as to what would constitute an *accurate* relationship, nor could such be expected. The difficulty here is particularly clear with respect to the medium-scale machines where the range of activities was found to be so wide. In view of the fact that the medium-scale machines bulk so large in the total computer population, it will be useful in the analysis of subsequent surveys to consider sub-dividing the medium computers into several separate categories.

[5]The term 'organization' is used to refer to a whole enterprise or institution. The term 'establishment' is used to refer to that part of the enterprise or institution where the computer is located.

[6]Of the 26 computers operated by the manufacturers and distributors, 14 were classified by respondents as leased and 12 as owned. The rationale for this classification appears to be that some parent companies leased computers to their service bureaus which were operated as self-contained businesses. Had all 26 of these computers been arbitrarily classified as owned, two-thirds of the computers in Community and Business Services would have fallen into the owned category.

CHAPTER II–COMPUTER UTILIZATION

Growth in Computer Utilization

Two hundred and seventy-six of the 303 computers[1] in Canada at July 1, 1962, were being operated by the organizations which owned or rented them for a total of 15,997 hours per week. In addition, 61 of these 276 computers were being operated for or by 211 outside users for a total of 544 hours per week. The total average weekly usage of the 276 computers in Canada at the beginning of July 1962 was 16,541 hours per week. This represents an average of approximately 60 hours per computer per week, or an average utilization of one and one-half shifts. As well as the obvious vast absolute increase in utilization, due to the growth in the computer population, this also represents a relatively small but important proportional increase in computer utilization since January 1, 1960, when 89 computers were being used for a total of 4,854 hours a week or about an average of 55 hours per computer per week.

As in the previous survey, respondents were asked to list both their commercial or business data processing computer applications and their scientific or engineering applications, and to indicate the percentage of computer production time accounted for by each application. The total average number of computer hours used by the organization each week was then calculated and added to cumulative totals for either commercial or scientific utilization in those cases where 90 per cent or more of the total computer production time fell into either the business data processing or scientific categories. The total computer time on 173 computers was added to the business data processing category on this basis; and that of 73 computers to the scientific and engineering category. However, there were 30 computers on which substantial proportions of both business and scientific work were being run[2]. In these cases the total application time was pro-rated between the business and scientific categories.

Table 8 shows that a greater proportion of computer time was being devoted to business data processing (72 per cent) than to scientific or engineering computation (28 per cent). When these figures are weighted according to the capacity of the small, medium, and large computers on a ratio of

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TABLE 8

Total Weekly Computer Hours Used for Business Data Processing and Scientific Computation*, by Size of Computer, in Canada, January 1, 1960 and July 1, 1962

Type of Utilization	Large Computers				Medium Computers				Small Computers				Total Computers			
	Jan. 1, 1960 (9 computers)		July 1, 1962 (23 computers)		Jan. 1, 1960 (60 computers)		July 1, 1962 (219 computers)		Jan. 1, 1960 (20 computers)		July 1, 1962 (34 computers)		Jan. 1, 1960 (89 computers)		July 1, 1962 (276 computers)	
	Hours Per Week	Per Cent	Hours Per Week	Per Cent	Hours Per Week	Per Cent	Hours Per Week	Per Cent	Hours Per Week	Per Cent	Hours Per Week	Per Cent	Hours Per Week	Per Cent	Hours Per Week	Per Cent
Business Applications	602	82.5	1,763	87.0	1,710	53.5	9,520	76.0	10	2.0	1,230	16.0	2,322	51.0	11,513	72.0
Scientific Applications	128	17.5	263	13.0	1,483	46.5	3,011	24.0	586	98.0	1,210	84.0	2,197	49.0	4,484	28.0
Total Utilization	**730**	**100.0**	**2,026**	**100.0**	**3,193**	**100.0**	**12,531**	**100.0**	**596**	**100.0**	**1,440**	**100.0**	**4,519**	**100.0**	**15,997**	**100.0**

*These figures on computer utilization calculated in total hours per average week may be inflated by as much as 19.7 per cent because the allocation between business and scientific applications is based on 'computer production time' data whereas the total average weekly hours also include program testing and unscheduled down time. However, although the total hours shown may exaggerate the 'good production time' realized on business data processing and scientific computations, the proportional relationship between the two categories is adequately reflected.

1:10:100, commercial applications are then found to account for a little more than four-fifths (82.5 per cent) of total computer utilization while scientific applications make up only 17.5 per cent. It must be remembered, however, that some scientific and engineering computation work is carried out on analogue computers which have not been covered in this survey. Notwithstanding, there has apparently been a marked increase in the proportion of the greatly increased computer capacity that is being devoted to commercial as opposed to scientific applications since January 1, 1960, At that time only 51 per cent of all work performed by computers was commercial in nature and 49 per cent was scientific, while, on a weighted basis, business applications out-ranked scientific work almost three to one. This proportional increase in commercial applications seems to have taken place mainly in relation to the medium-sized computers which is probably not surprising in view of the major role played by the medium-scale hardware in the rapid expansion of the total computer population.

The proportion of total computer utilization accounted for by the several industrial groups followed fairly closely what might have been anticipated once the number and sizes of the computers operated by these groups were known (See Table 4).

As can be seen from the information contained in Table 9 overleaf, in 1962, as in 1960, Manufacturing, and Finance and Insurance proved to be the two groups with the largest volumes of business-type data processing, with Transportation, Communication and Other Utilities running a close third in 1962. These three groups accounted for approximately three-quarters (74 per cent) of the total volume of commercial data processing. It is interesting to note, however, that while Manufacturing, and Finance and Insurance accounted for over two-thirds of all commercial data processing in 1960, by 1962 their combined proportion had dropped to just over half (54 per cent). All the industry groups had, in fact, increased their business data processing operations in the two and one-half year period more rapidly than Manufacturing, and Finance and Insurance. Community and Business Services, and Public Administration and Defence continue to dominate the scientific and engineering utilization field, accounting for 75 per cent of the total volume of this type of computer work. At January 1, 1960, together they had accounted for about two-thirds of the total scientific and engineering computer utilization.

Types of Computer Applications

Respondents were asked to list their various computer applications under three headings: commercial or business applications, repeated scientific or engineering applications, and 'one-time' applications. Virtually all the 'one-time' computer applications were found to fall into the scientific or engineering category. While some of the scientific and engineering applications, such

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TABLE 9

Computer Utilization, by Major Industry Group, in Canada, July 1, 1962
and Percentage Comparisons with January 1, 1960

Industry Group	Business Applications (hours per week)	Scientific Applications (hours per week)	Total Utilization (hours per week)	Percentage of Total Utilization July 1, 1962	Percentage of Total Utilization Jan. 1, 1960
Manufacturing	3,711	898	4,609	28.8	31.9
Community and Business Services	1,048	2,159	3,207	20.0	21.0
Finance and Insurance	2,605	33	2,638	16.5	16.1
Public Administration and Defence	1,132	1,250	2,382	14.9	15.6
Transportation, Communication and Utilities	2,191	104	2,295	14.3	14.4
Trade	728	–	728	4.6	1.0
Mining	98	40	138	0.9	–
Total	**11,513**	**4,484**	**15,997**	**100.0**	**100.0**

TABLE 10

Percentage Distribution of Commercial Computer Applications, by Major Industry Group, in Canada, January 1, 1960 and July 1, 1962

Application	Manufacturing		Finance and Insurance		Transportation, Communication and Utilities		Public Administration and Defence		Community and Business Services		Trade		Mining		All Industry Groups	
	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Accounts Receivable, Accounts Payable, Customer Billing	19.7	30.8	40.3	42.0	31.9	33.6	14.3	30.0	–	1.4	51.2	50.4	–	8.9	27.8	33.1
Financial Analysis and Statistics	3.8	3.4	13.9	19.9	–	16.3	17.0	8.1	3.9	27.1	4.4	4.0	–	4.1	6.8	11.4
Payroll	19.2	12.7	8.8	1.4	34.4	21.5	24.1	10.6	2.0	1.8	4.4	3.0	–	4.2	18.0	10.5
Inventory Control	22.7	10.3	–	0.6	6.7	3.7	32.1	23.4	5.8	4.0	28.9	29.6	–	–	12.7	8.6
Production Control	17.2	11.8	–	0.2	0.4	0.1	–	0.7	1.0	16.7	–	2.4	–	–	7.0	5.3
Sales Analysis	7.1	11.6	3.8	1.2	0.2	1.2	0.8	–	9.7	7.2	11.1	3.4	–	–	4.7	5.3
General, Budget and Cost Accounting	8.9	12.6	19.7	16.7	–	5.3	3.6	6.9	7.8	4.4	–	–	–	21.8	10.0	11.0
Traffic and Transportation	0.3	2.2	–	–	17.1	8.1	–	–	–	1.1	–	–	–	–	3.3	2.5
Quality Control	–	0.1	–	–	–	–	–	–	4.8	–	–	–	–	–	0.2	0.1
Miscellaneous (incl. Program Testing and Development)	1.1	4.5	13.5	18.0	9.3	10.2	8.1	20.3	65.0	36.3	–	7.2	–	61.0	9.5	12.2
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	–	**100.0**	**100.0**	**100.0**

TABLE 11

Percentage Distribution of Total Computer Time, by Type of Utilization, and by Major Industry Group, in Canada, July 1, 1962*

Type of Utilization	Manufacturing	Community and Business Services	Finance and Insurance	Public Administration and Defence	Transportation, Communication and Utilities	Trade	Mining	All Industry Groups
	%	%	%	%	%	%	%	%
Commercial or Business Data Processing	53.3	13.4	59.9	24.4	58.6	70.9	51.6	44.4
Regular or Repeated Scientific or Engineering Applications	11.1	18.6	1.0	25.7	6.6	–	9.3	11.8
One-Time Applications	3.9	18.7	2.5	9.5	1.3	3.9	10.7	7.0
Program Testing	12.6	16.6	17.8	15.3	7.5	5.5	21.3	13.7
Scheduled Maintenance	4.2	3.7	4.8	4.6	3.1	4.5	3.7	4.1
Unscheduled Down-Time	2.7	3.1	3.1	2.9	1.4	1.8	2.4	2.7
Other Users	0.6	6.2	0.1	2.5	0.6	0.9	–	1.9
Idle Time	11.2	12.7	7.8	13.0	19.1	12.5	1.0	12.0
Other	0.4	7.0	3.0	2.1	1.8	–	–	2.4
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

* Respondents have reported distribution of computer time at July 1, 1962. It should be remembered that respondents implemented data processing at different dates and that the pattern of utilization between production, program testing, etc., for particular installations will vary according to the length of time the system has been in operation.

as linear programming, regression analysis, curve-fitting, etc., were found to recur frequently, the great majority of scientific and 'one-shot' applications were found to be specific to the industry or organization in which they occurred. On the other hand, the commercial or business applications being run on 203 computers lent themselves somewhat more readily to analysis. A ten-fold breakdown, similar to that used in the 1960 survey, has again been used. (See Table 10, page 25).

Breakdown of Total Computer Time

Respondents were also asked to give a percentage breakdown of total computer time.

The Community and Business Services group includes computer service centres which accounts for the relatively large percentage (6.2 per cent) reported for Other (i.e., outside) Users. This group also includes universities and the 7 per cent in 'Other' is made up mainly of computer time used for teaching. (See Table 11, page 26).

Shift Work and Computer Utilization

Almost 60 per cent of the 284 computers on which shift work information was available were being operated on a regular overtime or shift work basis at July 1, 1962. Although the proportion of computers used only on a day

TABLE 12

Percentage of Computers Operated on Shifts, by Size of Computer, in Canada, January 1, 1960 and July 1, 1962

Pattern of Shift Working	Large		Medium		Small		All Computers	
	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962
	%	%	%	%	%	%	%	%
Day Shift Only	33.3	13.0	30.0	39.8	50.0	65.7	34.8	40.8
Day Shift Plus Regular Overtime	11.2	8.7	50.0	27.0	50.0	28.5	46.1	25.7
Two Shifts	55.5	21.8	20.0	16.4	—	2.9	19.1	15.2
Three Shifts		56.5		16.8		2.9		18.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

TABLE 13

Percentage of Computers Operated on Shifts, by Major Industry Group, in Canada, January 1, 1960 and July 1, 1962

Pattern of Shift Working	Manufacturing		Community and Business Services		Finance and Insurance		Public Administration and Defence		Transportation, Communication and Utilities		Trade		Mining		All Industry Groups	
	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962	Jan. 1, 1960	July 1, 1962
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Single Shift Only	36.7	47.9	42.3	32.2	25.0	41.9	23.1	46.2	28.6	24.1	100.0	41.2	–	66.7	34.8	40.8
Day Shift Plus Regular Overtime	43.3	20.2	53.8	37.3	41.7	20.9	61.5	28.2	14.3	20.7	–	35.2	–	–	46.1	25.7
Two Shifts	20.0	23.4	3.9	13.6	33.3	18.6	15.4	5.1	57.1	3.5	–	11.8	–	–	19.1	15.2
Three Shifts		8.5		16.9		18.6		20.5		51.7	–	11.8	–	33.3		18.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	–	**100.0**	**100.0**	**100.0**

shift basis had increased somewhat from January 1, 1960 (from 34.8 per cent to 40.8 per cent), the percentage of computers used on two or more shifts a day had increased substantially from 19.1 per cent to 33.5 per cent. Two-shift and three-shift systems appear to be about equally prevalent.

As would be expected, the larger the computer installation, the more likely it is to be operated on a multiple shift basis. For computer renting organizations that have a volume of computer work in excess of that which can be discharged on the basis of the regular contract month, overtime and shift working is made more attractive economically by the decreased hourly rental charge on equipment that applies to additional utilization. And for organizations which own computers, multiple shift operation allows a more rapid write-off of the large capital outlay involved.

A breakdown of shift working by industry group is included as set out in Table 13.

The rather low ratio of multiple shift working to regular day working shown in these tables may be partly explained by the high proportion of new computers brought into operation in the reporting period. Later reports may show a higher proportion of multiple shift-working, as experience suggests that heavier computer loading begins to build up quickly after the initial period of installation shake down.

Length of Work Week

Of the 284 computers for which information is available, 9 were operated on less than a five-day week; 190 were operated five days a week; 16 were operated five and a half days; 43 were run on a six-day week; and 22 were

TABLE 14

Length of Computer Work Week, by Size of Computer, in Canada, July 1, 1962

Computer Size	Used Only When Needed	Less than 5 days	5 days	5½ days	6 days	7 days
Large Computers	—	—	13	4	4	2
Medium Computers	4	2	159	10	35	16
Small Computers	—	7	18	2	4	4
Total	**4**	**9**	**190**	**16**	**43**	**22**

operated seven days a week. The remaining 4 computers were operated 'only when needed'. This pattern of computer working is very similar to that at January 1, 1960 when the great majority of the smaller number of computers were also operated on a straight five-day week.

Computer Utilization by Outside Organizations[3]

Of the total weekly computer time used in Canada at July 1, 1962, 634 hours were used by outside organizations who had contracted for time on 63 computers belonging to other organizations. On January 1, 1960, this figure was 335 hours. Hence, the proportion of computer time used by non-computer operating organizations on a service bureau basis has apparently not increased as fast over the period since the first survey as the trebling of the number of computers in Canada. This use of computers by other organizations accounted for only 3.8 per cent of total computer utilization, compared with 7.4 per cent in 1960. This fact also appears to be borne out with respect to the number of outside users. On January 1, 1960, there were 126 such users whose work affected 29 out of a total population of 89 computers. Whereas at July 1, 1962, there were 215 outside users.

This relatively slower rate of growth in computer service bureau work — the fact that the number of such users and the number of hours of computer time used by these organizations has apparently not even doubled since January 1, 1960, while the number of computers and total hours of computer utilization have both more than tripled — tends to contradict what might have been expected on a common sense basis. While it is true that the turnover among such customers will be predictably high with many organizations acquiring their own computers after trial operations on a service bureau basis, it would have seemed reasonable to expect at least a proportionally larger compensating volume of work from other organizations who found it more economical to have their small volume computer work discharged by a service bureau on a continuing basis, and by periodic 'one-shot' applications and overflow work from organizations operating their own computers. Part of the explanation may be that the smaller, less expensive, modular Solid State computers coming onto the market in this period may have made computer ownership or rental a more attractive proposition for many previous and potential commercial service bureau clients. It should also be noted that service bureau work is naturally relatively more expensive and that the 'breakeven' point between the cost of renting a computer and renting service bureau time may be reached fairly quickly in terms of the number of computer hours required.

Computer Programming

Respondents were asked to give some indication of the programming time (in man-hours) that had been involved in getting their various applica-

tions 'on-the-air'. A breakdown of programming hours for commercial, scientific and 'one-time' applications by major industry group, and by size of computer has been included as Table 15, page 32.

The number of computers in relation to which such information was available was 180, These included 18 large-scale computers, 143 medium-sized computers and 19 small computers. The number of computers having commercial applications for which information was reported was 155; for scientific applications there were 55 computers and for 'one-shot' applications there were 95 computers. Respondents were also asked to indicate the method or methods by which their programming had been accomplished, i.e., by machine language programming, by assembly-type programming or by compiler-type programming. For 265 computers on which information was reported, it was found that 25 per cent of all programming had been accomplished on the basis of machine language programming, 52 per cent by means of assembly-type programming and 23 per cent by compiler-type programming.

TABLE 15

Programming Man-Hours Involved in Getting Commercial, Scientific and 'One-Shot' Applications 'On-the-Air', by Major Industry Group, and by Size of Computer, in Canada, July 1, 1962*

Type of Application	Finance and Insurance			Manufacturing			Public Administration and Defense			Transportation, Communications and Utilities		
	Large	Medium	Small	Large	Medium	Small	Large	Medium	Small	Large	Medium	Small
Commercial or Business	(8)† 563,080	(21) 163,065	–	(2) 83,790	(58) 307,520	(4) 944	(2) 122,100	(11) 56,564	–	(2) 144,340	(11) 40,385	–
Scientific or Engineering	–	–	–	(1) 7,320	(15) 44,475	(5) 1,971	–	(8) 36,050	(4) 13,840	(2) 28,025	(3) 1,907	(1) 1,050
One-Shot	(5) 32,580	(9) 13,960	–	(1) 120	(29) 9,847	(4) 760	(2) 120,164	(4) 3,870	(5) 480	(2) 26,960	(3) 613	(1) 275
Sub-Total	(8) 595,660	(21) 177,025	–	(2) 91,230	(64) 361,842	(6) 3,675	(3) 242,264	(14) 96,484	(5) 14,320	(2) 199,325	(11) 42,905	(1) 1,325
Total	**772,685**			**456,747**			**353,068**			**243,555**		

Type of Application	Community and Business Services			Trade			Mining			All Industry Groups		
	Large	Medium	Small	Large	Medium	Small	Large	Medium	Small	Large	Medium	Small
Commercial or Business	(3) 18,570	(13) 34,312	(4) 480	–	(15) 75,144	–	–	(1) 3,000	–	(17) 931,880	(130) 679,990	(8) 1,424
Scientific or Engineering	(2) 36,778	(6) 1,889	(6) 2,595	–	–	–	–	(2) 3,020	–	(5) 72,123	(34) 87,341	(16) 19,456
One-Shot	(3) 10,310	(12) 8,319	(4) 620	–	(9) 1,951	–	–	(2) 2,230	–	(13) 190,134	(68) 40,790	(14) 2,135
Sub-Total	(3) 65,658	(16) 44,520	(7) 3,695	–	(15) 77,095	–	–	(2) 8,250	–	(18) 1,194,137	(143) 808,121	(19) 23,015
Total	113,873			77,095			8,250			2,025,273		

*Respondents have reported total cumulative programming man-hours to July 1, 1962. It should be remembered that respondents implemented data processing at different dates and that the number of programming man-hours reported for each installation will vary according both to the length of time the computers have been in operation and to the nature of the applications programmed.

†The figures in brackets indicate the number of computers for which information was reported.

Footnotes

[1]Information on average weekly hours of use was unavailable for the remaining 27 installations.

[2]The pattern of utilization on these 30 computers showed the following distribution between business and scientific applications:

	Number of Computers				
	50 – 60%	60 – 70%	70 – 80%	80 – 90%	Total
Commercial applications	4	2	10	1	17
Scientific applications.....	2	2	5	4	13
Total.....					**30**

[3]Of the total of 63 computers used by outside users, 2 were service bureaus operated by one of the computer manufacturers and distributors. The information available regarding these two installations was not sufficiently comparable for them to be included in the analysis in Section 1. These 2 computers were used by four outside users for a total of 90 hours per week, bringing the total hours per week for outside users up from 544 (Cf. Section 1) to 634.

CHAPTER III—ELECTRONIC DATA PROCESSING PERSONNEL

Although a mailed survey is not a satisfactory method of discovering how many office jobs the 303 computers may have eliminated, it is useful for assessing the number of new jobs that have been created by electronic data processing and jobs that are associated with E.D.P.

Full-Time E.D.P. Personnel

The survey showed that there were 3,437 people employed in full-time E.D.P. jobs at July 1, 1962. This represents an approximate trebling of the 1,216 E.D.P. personnel reported at January 1, 1960. Thus the expansion in full-time E.D.P. personnel appears to have just about paralleled the rate of increase in the number of computers that took place during the two and a half year period.

Commenting on the occupations listed in Table 16 on page 36, it is clear that the number of administrators has trebled since January 1, 1960. The project planners, systems designers and systems analysts increased their number between three and four times. On the other hand, the programmers expanded their numbers only two and a half times—a slightly lower rate of increase than for the population of full-time E.D.P. personnel as a whole. This differential proportional rate of increase between systems personnel and programmers may reflect a relatively rapid upgrading of experienced programmers into systems work and a proportional contraction in the number of programmers required due to the building up of program libraries and 'software' developments in the fields of assembly-type and compiler-type programming routines. Since many organizations do not in fact draw a rigid operational distinction between systems analysts and programmers, probably the more important and more reliable finding is that the senior administrator, systems analyst and programmer group as a whole has approximately trebled its numbers.

At the operational level of the E.D.P. occupational hierarchy, the number of computer operators has also somewhat more than trebled. Some

part of this greater-than-average increase may be attributable to a further extension of shift work in the pattern of computer utilization. The number of computer technicians, however, appears to have only doubled. It may be that the substantial increase in the number and concentration of medium and and small computers in local communities has permitted the individual technician to service a number of separate installations. Further, the new

TABLE 16

Full-Time Electronic Data Processing Personnel,
in Canada, January 1, 1960 and July 1, 1962

Occupation*	July 1, 1962			Jan. 1, 1960
	Male	Female	Total	Total
Administrator	427	85	512	167
Project Planner, Systems Designer, Systems Analyst	426	10	436	122
Programmer	743	131	874	357
Computer Operator†	421	52	473	144
Computer Technician‡	253	—	253	130
Peripheral Equipment Operator	441	99	540	
Tape Librarian	26	37	63	
Receptionist, Secretary, Stenographer, Typist, Messenger, etc.	29	124	153	296
Other Full-Time E.D.P. Personnel	103	30	133	
Total Full-Time E.D.P. Personnel	**2,869**	**568**	**3,437**	**1,216**

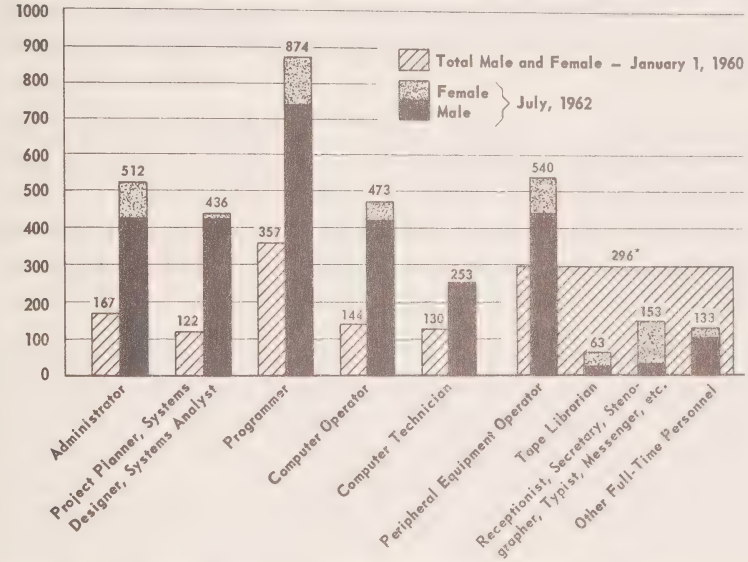
*See Appendix D for detailed descriptions of systems, programming and operating occupations.

†Includes console operators and tape handlers.

‡No attempt was made to discover whether there were any female members of technical maintenance staff. The figure for computer technicians is somewhat less reliable than for other categories of personnel, because of respondent difficulty in reporting where a single technician might service several medium and smaller installations. The great majority of the technicians—241—were employees of the computer manufacturers and distributors. The universities employed 5 members of their own staffs as computer technicians; the federal government, 5; and transportation and communications, 2. In view of this situation, a more reliable count of technical maintenance personnel might have been obtained through approaching the manufacturers and distributors directly.

Solid State hardware does not require as much maintenance as the older vacuum tube equipment. Peripheral equipment operators, tape librarians, and miscellaneous full-time E.D.P. personnel have also trebled their numbers during the period under review.

CHART 4
GROWTH IN E.D.P. PERSONNEL – CANADA



*Total for peripheral equipment operators, tape librarians, receptionists, etc. and other full-time personnel which were not treated as separate categories in the 1960 survey.

There is another perspective from which these E.D.P. occupations should be viewed. It seems likely that both the 1960 and 1962 figures for full-time electronic data processing personnel, particularly with respect to systems analysts and programmers, understate the actual number of people in these occupations because the surveys were limited to staff associated with computers actually in operation at the reporting dates. A large number of planning and programming jobs had undoubtedly been generated in organizations which had made definite plans to convert to electronic data processing but had not yet received delivery of the hardware. Also, the computer manufacturers themselves employ large numbers of planners and programmers on their systems development and systems support staffs. Finally, at least a portion of those organizations which do not have computers of their own but which contract for applications to be run on the facilities of commercial E.D.P. service bureaus may employ systems analysts, programmers and even computer operators of their own. Therefore, a more accurate estimate of the number of full-time E.D.P. personnel in Canada at July 1, 1962 might be approximately 1,000 higher than the figure shown in Table 16, bringing the total to between 4,000 and 5,000.

In the 1960 survey attention was drawn to the high ratio (53 per cent) in E.D.P. staffing which the more senior planning occupations bore to the more junior operating and ancillary occupations. In the 1962 data, the administrators, planners and programmers also made up 53 per cent of the full-time E.D.P. personnel complement. At first glance, this suggests a dramatic rise in the skill composition of the 'automated' office compared to the traditional structure of the clerical office. However, as will be explained below this 1:1 ratio drops to a more normal 1 senior to 5 junior employees when the key-punch operators and clerks associated with E.D.P. are taken into account.

The distribution of full-time E.D.P. jobs between men and women at July 1, 1962 favoured males four to one over females. At January 1, 1960, men had outnumbered women in these positions three to one. However, in 1962, 12 per cent of the higher level administrative, planning and programming positions were held by women — a slightly higher proportion than the 10 per cent of the senior E.D.P. positions occupied by females in 1960.

In the jobs associated with operating the computer and related peripheral equipment and the technical jobs associated with servicing and maintaining the equipment, the male employees outnumbered females by 9 to 1. Only 11 per cent of the console operators and tape handlers were female, none of the electronic technicians were women, and only 18 per cent of the peripheral equipment operators were female. Apparently it is only at the more junior levels of the E.D.P. occupational hierarchy and in the sorts of office jobs traditionally staffed by female employees — receptionists, secretaries, typists, stenographers, and tape librarians — that the female complement of E.D.P. staffs begins to be filled out.

Additional Full-Time Personnel Closely Associated With E.D.P.

In addition to the categories of E.D.P. occupations included in the 1960 survey, two additional categories of full-time E.D.P. personnel were included in the 1962 questionnaire:

a) key-punch, verifier, data typing, communications and related machine operators employed full-time in computer and computer-related work; and

b) data origination, data control and co-ordinating clerks involved full time in preparing input for the computer and in checking and distributing computer output.[1]

TABLE 17

Additional Full-Time Personnel Associated with E.D.P., in Canada, July 1, 1962

Occupation	Male	Female	Total
Key-Punch and related Machine Operators	152	1,694	1,846
Data Origination and Data Control Clerks	1,325	1,936	3,261
Total	**1,477**	**3,630**	**5,107**

It is useful to draw a distinction between these large E.D.P. punch card operator and E.D.P. clerical categories revealed in the 1962 survey and the foregoing categories of full-time E.D.P. personnel. Systems analysts and programmers, for example, are distinctively new occupations created by E.D.P. even though many of the employees in these occupations may have been recruited from other positions within the organization and trained for the new jobs. Even the computer operator jobs, though manned largely by experienced mechanical tabulating personnel, are clearly different from the traditional punched card department jobs and require either formal or intensive on-the-job training.

But the key-punch and clerical groups associated with E.D.P. work do not represent new occupations in the same sense. They are rather traditional occupations that have been changed or converted to an E.D.P. orientation. For example, the work of the key-punch operator remains the machine perforation of punch cards, the change being that the product of her work is now used as input for an electronic computer rather than for an electro-mechanical machine. Similarly, the functions of the data origination and data control clerks remain clerical — checking, maintaining control records, etc. — but the data is now arranged according to new formats to meet the requirements of the new equipment.

Consequently, it should not be inferred that these categories represent a net increment of thousands of new and additional office jobs occasioned by the introduction of electronic data processing. Rather, this is a conversion impact of E.D.P. on the traditional structure of office occupations through which the work of clerks and machine operators already in employment is adapted to the new system and equipment. Although the process of adapting the clerical and machine clerk staffs may be adequately handled on the basis of informal on-the-job training, these functions have taken on a new

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critical importance because the accuracy of any data processed by the computer is entirely dependent on the accuracy of the input data and the control exercised over the data while it is being prepared and introduced into the computer system. Hence it is essential that such staffs be composed of employees with a good general level of education who will bring a sense of responsibility to their work and discharge their assignment with meticulous accuracy and thoroughness.

In addition to the perhaps surprisingly large numbers of key-punch and clerical personnel associated with E.D.P. work on a full-time basis, the striking fact is the way in which female employees outnumber males almost 3 to 1 in these categories. The preponderance of females in the key-punching occupations is, of course, traditional. The rather higher proportion of males among the data clerks (41 per cent) suggests that the full-time clerical work associated with E.D.P. may be classified at the more senior and supervisory clerical levels where males have tended to be represented to a higher degree than in the clerical labour force as a whole. See Table 17 page 39.

Part-Time E.D.P. Personnel

Information was also collected on employees associated with E.D.P. on a part-time basis.[2] Part of the work of an additional 4,683 persons was found to be connected with E.D.P. installations.

This part-time work associated with electronic data processing is of two types: employees of user organizations, part of whose work is connected with E.D.P.; and additional employees brought into the organization on a temporary basis to facilitate launching the electronic data processing system.

From Table 18 it appears that this part-time E.D.P. work is about equally divided between men (53 per cent) and women (47 per cent). The part-time clerical work associated with E.D.P. accounts for over half of all such part-time activity. In this part-time clerical work, women outnumber men almost two to one.

Only about 4 per cent of part-time E.D.P. work appears to be accounted for by personnel brought in from the labour market on a temporary basis. This impression is probably misleading because, while the survey is conducted among operating computer installations, most of the extra-organizational part-time clerical workers are probably employed in organizations in the process of preparation for the introduction of an E.D.P. system.

Probably the biggest part of such additional clerical work connected with a conversion to E.D.P. consists in checking and collating existing visual and other records to ensure accurate and complete input for the new

system. This work may be initiated as early as two years before the computer is actually delivered. Much of this clerical 'housecleaning' falls on the regular clerical staff and is accomplished through regular and extended overtime work. But many organizations find that the volume of such work is so great that additional help is required. Meeting this requirement by hiring temporary clerical assistance has clear advantages in view of the subsequent clerical economies expected. The staffing of these clerical 'task forces' may be accomplished by hiring temporary employees on either a part-time or a full-time basis. The temporary nature and flexibility of daily or weekly working schedules probably makes these positions particularly suitable to married women, including those in their more mature years.

TABLE 18

Part-Time Electronic Data Processing Personnel,
in Canada, July 1, 1962

Occupation	Male	Female	Total
Intra-Organizational Personnel *			
Professional, Engineering, Scientific and Technical	772	38	810
Key-Punch, Tabulating and Other Machine Operators	195	551	746
Clerical	943	1,441	2,384
Other	500	58	558
Extra-Organizational Personnel †			
Clerical and Other	84	101	185
Total	**2,494**	**2,189**	**4,683**

* Personnel within the organization who spend **part of their time** in work associated with E.D.P.

† Personnel recruited from outside the organization on a **temporary full-time or part-time basis** to carry out work connected with preparation for conversion to E.D.P.

'Typical' Staffs of Different Sized Computer Installations

The personnel complement of an individual E.D.P. installation will, of course, vary with the size of the installation and with the sort of applica-

tions being performed. A hypothetical staff of a large electronic data processing installation in the head office of a large manufacturing firm, insurance company, or in a large government agency might typically include approximately 68 full-time E.D.P. personnel[3]: 8 administrators; 10 planners and systems analysts; 19 programmers; 7 console operators; 5 computer maintenance technicians; 10 peripheral equipment operators; 2 tape librarians; and a staff of 7 receptionists, typists, stenographers, messengers, etc. In addition to the computer centre personnel, a staff of 49 key-punch and related machine operators and 54 data clerks might be associated with such a large-scale installation on a full-time basis.

A hypothetical staff of a medium-sized E.D.P. installation might typically consist of 11 full-time E.D.P. personnel[4]: 3 administrators and systems personnel; 3 programmers; 2 computer operators; 1 computer technician; and 2 peripheral equipment operators and auxiliary personnel. In addition to this full-time E.D.P. staff, 6 key-punch operators and 13 data clerks might be associated with the installation on a full-time basis.

A hypothetical staff associated with a small computer might consist of only two or three employees[5]: 1 part-time administrator and planner; 1 programmer/operator, and the part-time services of a computer technician. In addition, a clerk-typist might be associated with the computer on a part-time or full-time basis.

Reported Shortages of E.D.P. Personnel

In the 1962 questionnaire for the first time, respondents were asked to provide information on shortages of full-time E.D.P. personnel. In view of the concern often expressed about the dearth of trained personnel to meet the occupational demands of this rapidly expanding field, the figures cited in Tables 19, 20 and 21 may seem surprisingly low. The reported shortages represented only 7 per cent of the total number of full-time E.D.P. positions.

However, it should be pointed out that these figures probably seriously understate the number of vacancies and employment opportunities that actually exist in E.D.P. work. In the first place, respondents were instructed to report only actual shortages of E.D.P. personnel required to meet current management approved objectives. In other words, the shortages reported represent only those actual vacancies for which the organizations were actively recruiting at July 1, 1962. Had the question asked user organizations how many additional E.D.P. positions would be created as applications were extended or new applications added over the course of the next 12 or 18 months, the number of employment opportunities reported would undoubtedly have been much greater.

Similarly, the limitation in the coverage of the survey to operating installations means that reported shortages probably fall far below actual shortages. The operating installations have by definition solved the bulk of their recruitment and training problems. Their problems will tend to be problems of maintaining their E.D.P. staffs at required levels and replacing the quotas they lose to other organizations in this highly competitive occupational field. Indeed, some of the more mature installations may already be reaching a point where their applications are running smoothly and actually require fewer personnel than were needed in preparatory and conversion phases. Undoubtedly, the bulk of the shortages of E.D.P. personnel exists in those organizations not covered by the survey – those that are in the process of preparing for and converting to an electronic data processing system.

The third factor that tends to minimize the number of reported shortages of E.D.P. personnel stems from the manner in which the E.D.P. staff has commonly been recruited and trained to date. Although a certain proportion of the process of adjustment between supply and demand takes place through the labour market, especially with respect to systems analysts and programmers, the bulk of the selection of E.D.P. personnel probably takes place

TABLE 19

Reported Shortages of E.D.P. Personnel, in Canada, by Occupation and by Region, July 1, 1962

Occupation	Atlantic	Quebec	Ontario	Prairie	Pacific	**Total**
Administrator and Supervisor	–	2	9	3	–	14
Project Planner, Systems Designer, Systems Analyst	–	11	27	5	–	43
Numerical Analyst	–	2	9	2	2	15
Programmer	2	18	85	14	3	122
Computer Operator	–	9	18	5	–	32
Peripheral Equipment Operator	1	1	11	5	1	19
Other Full-Time E.D.P. Personnel	–	2	6	–	4	12
Total	**3**	**45**	**165**	**34**	**10**	**257**

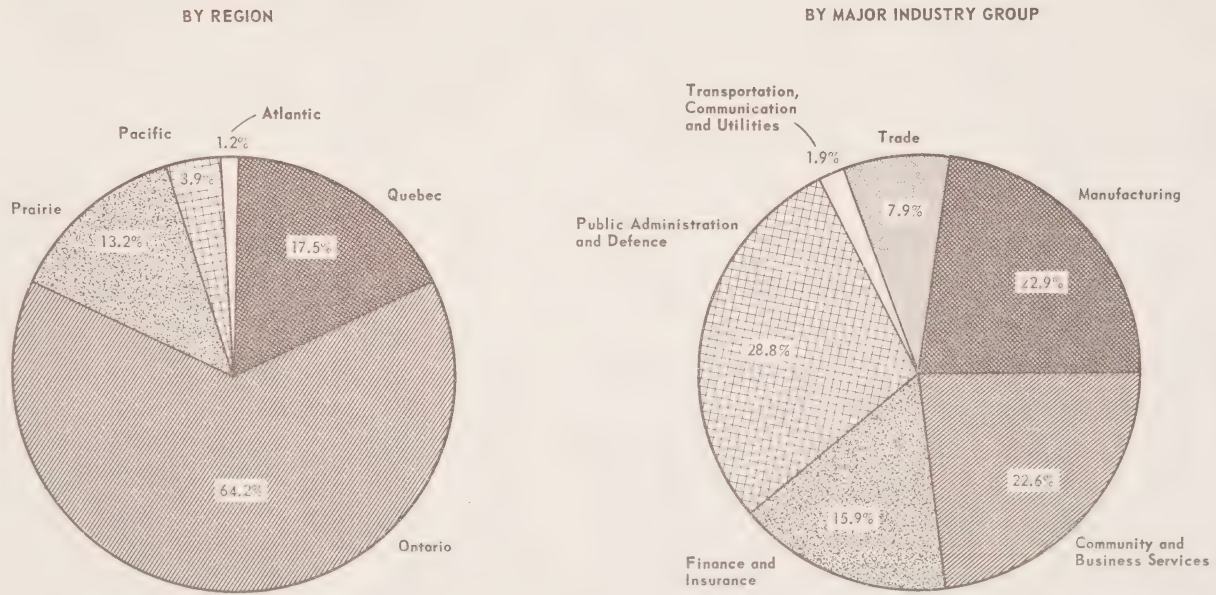
TABLE 20

Reported Shortages of E.D.P. Personnel, in Canada, by Occupation and by Major Industry Group, July 1, 1962

Occupation	Manufacturing	Community and Business Services	Finance and Insurance	Public Administration and Defence	Transportation, Communication and Utilities	Trade	Mining	Total
Administrator and Supervisor	2	2	1	5	1	3	–	14
Project Planner, Systems Designer, Systems Analyst	13	4	12	7	3	4	–	43
Numerical Analyst	3	4	–	7	–	1	–	15
Programmer	26	32	23	33	–	8	–	122
Console Operator	7	6	3	13	–	3	–	32
Peripheral Equipment Operator	2	9	–	6	1	1	–	19
Other Full-Time E.D.P. Personnel	6	1	2	3	–	–	–	12
Total	**59**	**58**	**41**	**74**	**5**	**20**	**0**	**257**

CHART 5

E.D.P. PERSONNEL SHORTAGES – CANADA, JULY 1, 1962



within the user organization. As a result, plans to build up E.D.P. staff are not as likely to be reported in the form of vacancies or shortages where the future incumbents are to be recruited internally and, indeed, may have already been selected and are undergoing training.

TABLE 21

Reported Shortages of E.D.P. Personnel, in Canada, by Region and by Industry Group, July 1, 1962

Industry Group	Atlantic	Quebec	Ontario	Prairie	Pacific	**Total**
Manufacturing	—	20	27	6	6	59
Community and Business Services	3	6	35	10	4	58
Finance and Insurance	—	7	34	—	—	41
Public Administration and Defence	—	—	60	14	—	74
Transportation, Communication and Utilities	—	3	—	2	—	5
Trade	—	9	9	2	—	20
Mining	—	—	—	—	—	—
Total	**3**	**45**	**165**	**34**	**10**	**257**

In addition to reporting numbers of E.D.P. personnel shortages, respondents were invited to append suggestions which might 'improve the supply, recruitment, training or utilization of E.D.P. manpower'. Only twelve respondents took advantage of this opportunity –half, simply acknowledging that they had no immediate staffing or training difficulties.

The E.D.P. director of a large life insurance company in which a large-scale computer had been in operation for a number of years reported:

> 'We have not, as yet, had any problems with regard to shortages of personnel in either the programming, computing operating, or data processing personnel. Our losses in all three areas have been minor and replacements have been readily available from within our own ranks or through newspaper advertisements.'

This situation was reflected in the comment of a data processing executive of a large manufacturing firm with a reputation for having one of the most efficient large-scale installations in the country:

'We cannot identify any actual shortages of E.D.P. personnel to meet our current requirements. In our company we have tended to develop these people from within our own organization and we believe we have resources of capable people who, with the necessary training, can meet our needs. We are aware of the fact that well-trained, capable people are generally in short supply in the open market, but when the occasion has arisen to go to this source for personnel, we have generally found it possible to meet our requirements.'

A third comment from another large manufacturing concern explained that they had no current shortages and added a comment on their philosophy and practice with regard to selection and training:

'It is the practice of this company to meet its requirements of personnel within the categories listed by internal transfers followed by comprehensive training. We have found no difficulty in teaching people computer techniques, but have found it quite impossible to teach new staff the details of the problems. For this reason staff are selected according to their thorough understanding of the applications with due consideration of other capabilities. However, it should be mentioned that (our company) because of the nature of its operations, has a wealth of suitable talent to draw on which might not be the case for other users of E.D.P. equipment.'

From the point of view of staffing commercial E.D.P. installations, the difficulties that were encountered appeared to involve the highest and lowest occupational levels of the E.D.P. hierarchy rather than the broad programming and operating bands. Several respondents drew attention to the problem of a shortage of qualified systems personnel with E.D.P. experience and others noted at least temporary bottlenecks in the supply of trained key-punch operators.

An organization and methods divisional head in a provincial government agency explained that:

'Programmers and console, etc., operators can be trained; often from existing staff. Systems designers and systems analysts present a different problem, requiring skills and disciplines that are not exclusive to any one course of formal education. Not until a good post-graduate course is established, dealing with this type of work and apart from business administration, shall we find an adequate source of supply.'

Two respondents commented on a shortage of key-punch operators and suggested that this situation might be rectified by training in the formal education system.

'There seems to be a dearth of personnel at key-punch, etc., level and facilities for training post-high school students (example, at technical institutes) would be welcome.'

'For key-punching and the use of sorters, verifiers, accounting machines, etc., perhaps instruction could be given in technical schools and business colleges much as for typing now.'

It is, however, worth noting that these comments were those of a doctor/administrator in a large municipal hospital and a director of a university computer centre. Such institutions might be expected to encounter more difficulty at this level than the large manufacturing and insurance companies employing large staffs of machine operators with appropriate facilities and programs for in-plant training.

However, one official of an insurance company stated:

'We have noticed from time to time shortages have occurred in the area of key-punch operators and it has been difficult on occasion to secure capable trained people on short notice.'

Only one respondent — a medium-sized manufacturing firm — felt that the preparation of E.D.P. personnel generally should be begun within the public education system.

'I feel that the introduction of courses such as "Introduction to E.D.P.", "Principles of Programming", etc., in our secondary schools — both as part of a commercial course, and as an adult extension course, would be beneficial to industry.'

Several respondents pointed out that the personnel and training needs associated with scientific and engineering applications differed from those encountered by the business data processing installations. They would like to see more scientific specialists with computer knowledge and experience and a larger group of numerical analysts, operations research specialists, and technical programmers.

One employer stated:

'There is also a serious dearth of science graduates from university with any knowledge at all of programming and E.D.P. techniques. It seems to me that some knowledge of computer procedures is virtually a must to the modern scientist.'

A university respondent explained:

> 'The much higher level of training required for computer solution of scientific and engineering problems can only be obtained in universities. Thus most universities now have computing centres. Many of these, however, act mainly as service centres to assist the research of other people. Others are well on the way to becoming properly recognized university departments of, say, "computing science", with academic appointments having teaching duties and research interests, offering courses for credit and a graduate degree, for example, "numerical analysis and computer techniques".'

A director of a university computer centre explained how the computer is being utilized in his university both for teaching and research. The relevance of this pattern of utilization to the problem of overcoming the acknowledged shortage of high-level E.D.P. personnel seems clear:

> 'The computing centre is used to assist in the research of the departments in the physical, biological and social sciences, including those in the Faculties of Engineering, Agriculture, Medicine, and some in the Faculty of Education. The centre gives courses to the Faculty of Engineering in numerical analysis and computer use, and to the Faculty of Commerce in data processing. Some departments in engineering use computer methods for solution of class problems.'

The growing number of computer installations in government – both federal and provincial – may be encountering somewhat more staffing difficulties than earlier entrants into the electronic data processing field. The comments of the director of one such installation – not necessarily typical of the relatively large number of such installations now in operation – have been included in full as Appendix E, to this report.

Footnotes

[1]It may be that some employees in these occupational categories were included in the 1960 survey under the miscellaneous category 'other full-time computer personnel'. However, there is reason to believe that the inclusion of these groups as separate reporting categories in the 1962 survey produced a much fuller response and it is consequently felt that it would be misleading to include these figures in a comparison with the 1960 results.

[2]Here again, it is felt that the more detailed categories provided for reporting various sorts of part-time E.D.P. personnel in the 1962 survey elicited a fuller count than did the single question on part-time personnel included in the 1960 questionnaire. Therefore, it would be misleading to compare the number of part-time E.D.P. personnel at the two dates.

[3]Averages compiled from the actual complements of 13 such installations, 2 in Manufacturing; 3 in Transportation and Utilities; 5 in Insurance; and 3 in Government.

[4]Averages compiled from the actual complements of 196 medium-sized computer installations.

[5]Averages compiled from actual complements of 32 small installations.

CHAPTER IV–POTENTIAL EMPLOYMENT IMPACT

No attempt has been made through this mailed survey to assess or estimate either the direct or indirect negative employment impact (or potential negative employment impact) of the introduction of electronic data processing. The complexity of the pattern of the negative effects of E.D.P. on employment renders a mailed enquiry respecting the problem inadequate. Although there remain serious conceptual and methodological problems to be overcome[1], the effects of the introduction of E.D.P. on employment is one of the major dimensions being studied in other investigations in this research project area, particularly the longitudinal case study of the introduction of a computer into a large Canadian insurance company and the field investigations being carried out at ten large-scale business data processing installations.

It may be of interest to note, however, that total employment in 113 organizations operating computers for commercial or business data processing purposes at July 1, 1962 was approximately 582,000[2]. (See Table 22 overleaf.)

Approximately 20 per cent (117,121) of the total employment figure in organizations operating business-type E.D.P. installations was found to be composed of clerical and clerical supervisory personnel[3]. This figure is based on returns from 106 organizations, with 7 organizations failing to report clerical employment.

It is considered that this figure of 117,000 constitutes a more realistic upper parameter for the current and potential employment and occupational impact area of electronic data processing in the organizations covered in this survey than the total cumulative employment figure of 582,000.

For the first time, in the 1962 survey, respondents were also asked to indicate the number of clerical employees whose employment or positions had been directly affected by the introduction of electronic data processing. The cumulative figure of 11,360[4] reported by 95 organizations represents approximately 10 per cent of the total population of clerical personnel in organizations operating business-type E.D.P. installations.

TABLE 22

Total Employment and Clerical Employment in Organizations Using Computers for Commercial or Business Data Processing, including Clerical Employees Affected by Electronic Data Processing, by Major Industry Group, in Canada, July 1, 1962*

Industry Group†	Total Employment‡			Clerical Employment§			Clerical Employees affected by E.D.P.#		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Transportation, Communication and Utilities	181,857	33,891	215,748	20,465	18,547	39,012	736	1,206	1,942
Manufacturing	167,754	31,011	198,765	24,188	14,321	38,509	1,721	1,005	2,726
Public Administration and Defence	65,149	25,615	90,764	5,828	8,430	14,258	280	563	843
Finance and Insurance	18,398	23,987	42,385	5,280	13,558	18,838	559	1,836	2,395
Trade	13,526	10,358	23,884	2,002	3,281	5,283	1,017	2,327	3,344
Mining	9,346	414	9,760	634	328	962	26	2	28
Community and Business Service	136	167	303	94	165	259	21	61	82
Total	**456,166**	**125,443**	**581,609**	**58,491**	**58,630**	**117,121**	**4,360**	**7,000**	**11,360**

*Please refer to Table footnotes on opposite page.

It is important to note that, although the proportion of male and female clerical workers in the population studied was just about equal, the jobs of two female clerks were affected by the introduction of E.D.P. for each male clerk's job. It should also be clearly pointed out that the question was phrased to elicit information on clerical displacement and change in job content in the broadest sense. That is to say, it should be clearly understood that the figure of 11,360 is not restricted to clerical workers who have lost their employment as a result of 'office automation'[5] nor even to employees whom computers have rendered redundant in their old positions and have undergone retraining and transfer to alternative jobs within the same organizations. Rather the figure is intended to include all clerical and clerical supervisory personnel whose positions or jobs have thus far been affected in any way by E.D.P. from layoffs attributable to automation on the one hand to relatively minor changes in job content on the other.

Footnotes to Table 22

†No regional employment distribution has been attempted (Cf. Table 13, Report No. 9A) because of the change from establishment to organization as the reporting base and the decentralized pattern of many of the larger organizations which operate plants and offices in two or more regions.

‡Based on figures supplied by 113 organizations. The Department of National Defence and its affiliated agencies accounts for approximately one half of the total employment in the Public Administration and Defence industrial group.

§Based on figures supplied by 106 organizations. Seven organizations did not supply figures. One large manufacturing firm explained that "clerical employment (was) unknown". One large firm in the Finance and Insurance group commented — "no statistics maintained". One large retail distributor in the Trade group accounted for more than 75 per cent of the clerical employment reported for this group, and one large manufacturer for more than a third of the clerical employment in the Manufacturing group.

#Based on figures supplied by 95 organizations. Eighteen respondents did not make a return under this heading. These include 7 respondents in Manufacturing; 5 in Finance and Insurance; 3 in Trade; 2 in Transportation, Communication and Utilities; and 1 in Public Administration and Defence. Fourteen of these organizations were large employers with large clerical work forces. Half of these 18 organizations offered explanations for this non-response, dividing almost equally between those who explained that the introduction of the new system was too recent to assess its impact on clerical and clerical supervisory personnel and those who explained that the impact was now "past history" and impossible to estimate in a meaningful way in relation to their current employment situation.

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Summing up, it is quite clear that the total employment in organizations using computers cannot be regarded as the potential employment area likely to be affected by electronic data processing. This figure will include large numbers of skilled, semi-skilled and unskilled plant workers whose security of employment is much more likely to be affected by technological changes in the factory than by E.D.P.

The figure for clerical workers employed in organizations using computers for business-type data processing is probably a much more realistic upper parameter for the number of jobs that may be affected, in varying degree, by electronic data processing.

In considering the potential occupational and employment impact of E.D.P., it is important to realize the unrealiability of aggregate figures. The reason for this is that so much will depend upon the magnitude of the equipment and on the sort of applications for which the computer is used. In the case of a limited number of large-scale installations, such as an insurance company which exploits the computer to permit 'combined operations', the application may approximate 'office automation'. In such cases it is probably reasonably accurate to assume that the conversion to E.D.P. is sooner or later going to affect the jobs of almost everyone in the organization to a greater or lesser extent.

But in the majority of computer installations, at present, the new equipment is probably used more commonly to perform the traditional tasks faster or more accurately. In these cases, the applications may be confined to a single department or the computer used to perform discrete tasks for several departments. The result is that the introduction of electronic data processing may only affect the work of certain groups of personnel within these specific departments.

Finally, (lest undue optimism be derived from the relatively low figures reported of clerical and clerical supervisory personnel affected), it should be pointed out that these figures do not include the impact on the clerical staffs of the growing number of organizations that elect to purchase E.D.P. work on a contract basis from the new commercial service bureaus. Nor can natural attrition, at the level of the individual concern, be expected to solve the possible problem of potential 'hidden unemployment' that may face the school leaver who looks for a first job in the office sector of a local labour market in which electronic data processing of the 'office automation' type may have become concentrated.

Footnotes

[1]These problems include: isolating E.D.P. as an independent variable for analysis, as distinct from other sorts of equipment, systems, organizational and economic changes; the construction of an adequate, practical measure of clerical productivity; a method of assessing employment impact on a local labour market basis to determine the extent of 'hidden' unemployment which tends to be obscured by attrition in studies at the level of the individual firm; a method for calculating the secondary employment and unemployment generating effects of E.D.P. to compare with direct employment generating and direct employment reducing effects, etc.

[2]Unfortunately, this figure is not comparable with the total employment figure of approximately 177,000 at January 1, 1960 referred to in Tables 13 and 14 (page 25) of the earlier report. On the one hand, the current figure reflects employment on an organization basis, while an attempt was made in the earlier report to ascertain employment on an establishment basis. While the establishment where the computer is actually located would appear to be a more realistic basis for estimating the outside upper parameter of potential employment effect, in practice the concept proved inadequate in view of the complexity of the pattern of centralized and decentralized computer utilization. The result of the adoption of the organization or firm basis for collecting employment statistics probably results in an artificial inflation of the potential employment impact area, not only in the sense that it includes large groups in occupational categories that will be completely unaffected by the introduction of E.D.P. (which is equally true of total employment figures compiled on an establishment basis) but also in the sense that the figures include large numbers in functional or organizational sectors that will be unaffected by the adoption of 'office automation'. On the other hand, the current figure has been restricted to organizations employing E.D.P. for commercial or business-type data processing applications where the major clerical impact is expected to be felt in contrast with the earlier figure which included employment in establishments using computers for scientific and engineering computations. The reason for this change is that it is believed that the direct negative employment impact of scientific hardware and applications is limited or negligible. That is to say, the computer used for scientific or engineering purposes is primarily a powerful new tool for professional personnel which increases their productivity and ability to undertake complex or extensive calculations that would have been out of the question in terms of both time and resources heretofore (either using punch-card equipment or desk calculators). While making no claim that the inflationary and deflationary devices employed in the present survey as compared with the 1960 data balance out, it is interesting to note that the upper potential total employment impact parameter is approximately triple that estimated for January 1, 1960 – a rate of expansion that parallels the growth of computer installations and the expansion of E.D.P. personnel.

[3]Once again, unfortunately, this figure cannot be compared with the 74,206 office employees who constituted a much larger proportion – 42 per cent – of total employment in establishments operating E.D.P. installations at January 1, 1960. The reason for this is not only that a much lower proportion of clerical employees would predictably be encountered on an organizational reporting basis including employment in plants as well as head offices, but also there was some reason to believe that the 1960 figure for office employment in establishments with E.D.P.

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installations tended to include some employees in a number of white collar occupational categories – inside and outside sales staffs, technical, professional, and administrative staffs, etc. – whose jobs would also certainly remain unaffected by the introduction of electronic data processing. As a result of this experience, a decision was made to restrict the reporting at July 1, 1962 to clerical, clerical supervisory, stenographic, typing and machine operating employment by including a more comprehensive list of the specific categories of office personnel that the respondent should include. Even so, however, most statistical reporting of this sort merely distinguishes between employees on a salaried payroll and those on an hourly-rated payroll. Therefore, this request must have presented many respondents with unusual reporting problems in relation to the manner in which the organization's records are maintained. It is, therefore, suggested that the 117,000 figure be looked upon as a helpful approximation rather than as a completely reliable count of clerical personnel in E.D.P. user organizations.

[4]This is perhaps the least reliable of the three cumulative employment figures. In the first place, a relatively large number of respondents indicated that it was either impossible to identify those clerical jobs that had been affected by E.D.P. or that their organizations had not found it necessary to keep a systematic record from which such a count could be provided. Secondly, it was apparent from a scrutiny of the returns that some respondents had interpreted the question very widely, pointing out that virtually their whole clerical work force had been affected by the change to some degree, while the majority interpreted the question narrowly, reporting only those clerical jobs that had disappeared as a result of the introduction of electronic data processing.

[5]Many respondents made a special point of insisting that clerical displacement and redundancy had not resulted in clerical dismissal or layoff, explaining that such an effect had been avoided because of attrition, a reduced level of new clerical hires, growth in volume of business, retraining, transfers, careful preplanning, etc. The overall impression made by these comments was that little clerical layoff due to office automation was taking place among current clerical and clerical supervisory staff at the level of the individual undertaking.

CHAPTER V–SALARIES OF E.D.P. PERSONNEL

The 1962 survey included a questionnaire on salary rates for selected electronic data processing occupations. (See Appendix D for descriptions of the occupations included in the survey). This was a first attempt to obtain factual information on salaries paid across Canada in these occupations[1]. Because of the necessarily broad occupational definitions employed, and the experimental nature of this attempt to relate salary information to occupations in a relatively new field, the results should only be regarded as a general indication of the pattern of remuneration of personnel employed in electronic data processing.

The salary data in this chapter has been arranged in a set of tables to show average monthly[2] salaries and salary ranges for employees in a selection of E.D.P. occupations on a country-wide basis (and the same information presented in the form of salary rate frequency distributions); average salaries and salary ranges for E.D.P. employees in the several geographic regions; average salaries and ranges for E.D.P. employees in the several major industrial groups; and salary information on an industrial basis for E.D.P. employees in two metropolitan areas – Montreal and Toronto.

Although predominant salary ranges include only the rates for the middle 80 per cent[3] of the number of employees in each occupation, full salary ranges broken down by sex and by number of employees involved may be obtained from the frequency distribution tables. A number of these latter distributions are somewhat widely dispersed especially in the more highly remunerated occupations, but all the rates have been included in the frequency tables in order to give as complete and as detailed a picture as possible of this growing field of employment. The average salaries are, of course, calculated on the basis of all the rates listed for employees in each occupation[4].

The employee statistics in the salary tables are not strictly comparable to the computer personnel figures listed in Chapter III because of a slightly different breakdown of the occupations. Except for the categories of computer technician and peripheral equipment operator, however, they are reasonably close .

TABLE 23

Monthly Salary Rates of E.D.P. Personnel, in Canada, by Occupation,

July 1, 1962

Occupation	Male		Female		Total	
	Average Salary	Predominant Range	Average Salary	Predominant Range	Average Salary	Predominant Range
	$	$	$	$	$	$
Project Planner	803	588–1,000	–	–	803	588–1,000
Systems Designer	701	550– 850	*	†	699	550– 850
Systems Analyst	606	477– 750	*	†	605	475– 750
Chief Programmer	638	500– 835	*	†	638	500– 850
Senior Programmer	549	425– 700	462	347– 550	541	417– 683
Programmer	490	370– 600	435	350– 540	481	364– 600
Junior Programmer	432	300– 550	392	303– 475	425	300– 530
Programmer Trainee	397	303– 475	315	260– 375	384	300– 465
Programmer Operator	439	340– 550	368	†	426	312– 550
Senior Console Operator	466	325– 602	398	†	462	325– 600
Console Operator	379	286– 450	325	250– 400	373	282– 450
Junior Console Operator	333	217– 417	269	225– 310	326	217– 417
Peripheral Equipment Operator	343	256– 424	274	217– 340	317	230– 400
Computer Maintenance Technician	491	321– 702	–	–	491	321– 702
Tape Librarian	299	245– 360	353	268– 435	332	245– 425

*Refer to footnote 4, page 68.

†Refer to footnote 3, page 68.

TABLE 24

Monthly Salary Rate Frequency Distribution for E.D.P. Personnel, Male and Female, in Canada, by Occupation, July 1, 1962

Monthly Salary Rate	Number of Employees at Salary Rate														
	Project Planner	Systems Designer	Systems Analyst	Chief Programmer	Senior Programmer	Programmer	Junior Programmer	Programmer Trainee	Programmer/Operator	Senior Console Operator	Console Operator	Junior Console Operator	Peripheral Equipment Operator	Computer Maintenance Technician	Tape Librarian
$															
1,000 Plus	12	1	–	1	–	1	–	–	–	–	–	–	–	1	–
975–999	2	–	–	1	–	–	–	–	–	–	–	–	–	–	–
950–974	4	–	–	2	–	–	–	–	–	–	–	–	–	–	–
925–949	2	–	–	1	1	–	–	–	–	–	–	–	–	–	–
900–924	5	3	2	1	1	–	–	–	–	–	–	–	–	–	–
875–899	5	4	–	–	1	–	–	–	–	–	–	–	–	–	–
850–874	4	7	1	3	3	–	–	–	–	–	–	–	–	–	–
825–849	6	9	1	2	1	–	–	–	–	–	–	–	–	–	–
800–824	8	5	6	–	–	–	–	–	–	–	–	–	–	–	–
775–799	5	19	5	2	2	–	–	–	–	–	–	–	–	–	–
750–774	13	11	9	3	1	2	1	–	–	4	–	–	–	–	–
725–749	5	5	3	1	1	4	–	–	–	1	–	–	–	1	–
700–724	4	10	12	4	10	2	–	–	–	3	–	–	–	1	–
675–699	7	4	1	4	9	7	–	1	–	–	–	–	–	–	–
650–674	2	14	22	5	9	10	–	–	–	2	–	–	3	–	–
625–649	1	6	23	6	11	2	2	–	–	–	–	–	–	–	–
600–624	4	10	14	8	13	20	2	–	–	4	1	–	–	–	–
575–599	4	4	13	9	12	21	4	–	1	5	4	–	–	1	–
550–574	7	14	21	9	17	17	3	2	4	6	3	–	–	–	–
525–549	1	4	21	3	20	36	5	1	–	5	2	–	–	2	–
500–524	–	5	14	10	24	47	18	1	2	12	11	–	–	5	1
475–499	–	3	6	2	16	39	13	1	4	14	2	–	7	–	–
450–474	–	–	11	–	26	55	11	8	7	12	12	2	6	–	–
425–449	–	2	1	2	13	27	15	4	3	16	39	5	19	2	4
400–424	–	–	–	1	12	44	16	10	4	8	37	15	29	4	–
375–399	–	–	2	–	7	28	12	7	2	11	37	20	70	2	5
350–374	–	–	1	1	3	18	8	5	1	9	32	5	27	–	8
325–349	–	–	3	–	3	18	13	9	3	5	50	16	95	–	6
300–324	–	–	–	–	2	4	5	7	3	3	26	9	66	2	1
275–299	–	–	–	–	–	9	6	1	1	1	14	5	78	–	4
250–274	–	–	–	–	–	–	5	3	1	5	12	9	68	–	4
225–249	–	–	–	–	–	–	2	2	1	3	12	5	39	–	3
200–224	–	–	–	–	–	–	–	–	–	–	2	9	32	1	2
Under 200	–	–	–	–	–	–	–	–	–	–	–	7	10	–	–
Total Employees	**101**	**140**	**192**	**81**	**218**	**411**	**141**	**62**	**37**	**129**	**296**	**107**	**549**	**22**	**38**

TABLE 24a

Monthly Salary Rate Frequency Distribution for Male E.D.P. Personnel, in Canada, by Occupation, July 1, 1962

Monthly Salary Rate	Number of Employees at Salary Rate														
	Project Planner	Systems Designer	Systems Analyst	Chief Programmer	Senior Programmer	Programmer	Junior Programmer	Programmer Trainee	Programmer/Operator	Senior Console Operator	Console Operator	Junior Console Operator	Peripheral Equipment Operator	Computer Maintenance Technician	Tape Librarian
$															
1,000 Plus	12	1	–	1	–	1	–	–	–	–	–	–	–	1	–
975–999	2	–	–	1	–	–	–	–	–	–	–	–	–	–	–
950–974	4	–	–	2	–	–	–	–	–	–	–	–	–	–	–
925–949	2	–	–	1	1	–	–	–	–	–	–	–	–	–	–
900–924	5	3	2	1	1	–	–	–	–	–	–	–	–	–	–
875–899	5	4	–	–	1	–	–	–	–	–	–	–	–	–	–
850–874	4	7	1	2	3	–	–	–	–	–	–	–	–	–	–
825–849	6	9	1	2	1	–	–	–	–	–	–	–	–	–	–
800–824	8	5	6	–	–	–	–	–	–	–	–	–	–	–	–
775–799	5	18	5	2	2	–	–	–	–	–	–	–	–	–	–
750–774	13	11	9	2	1	2	1	–	–	4	–	–	–	–	–
725–749	5	5	3	1	1	4	–	–	–	1	–	–	–	1	–
700–724	4	10	12	4	10	2	–	–	–	3	–	–	–	1	–
675–699	7	4	1	4	9	7	–	1	–	–	–	–	–	–	–
650–674	2	14	22	5	8	10	–	–	–	2	–	–	3	–	–
625–649	1	6	21	6	11	2	2	–	–	–	–	–	–	–	–
600–624	4	10	14	8	13	20	2	–	–	4	1	–	–	–	–
575–599	4	4	12	8	12	21	4	–	1	5	4	–	–	1	–
550–574	7	14	21	9	15	14	3	2	3	6	3	–	–	–	–
525–549	1	2	21	3	18	29	5	1	–	5	2	–	–	2	–
500–524	–	5	14	10	21	42	16	1	2	12	11	–	–	5	–
475–499	–	2	6	2	14	33	9	1	3	13	1	–	7	–	–
450–474	–	–	11	–	25	47	7	8	7	11	12	2	6	–	–
425–449	–	2	1	2	11	24	14	4	3	15	36	5	18	2	–
400–424	–	–	–	–	9	28	15	10	4	8	36	15	27	4	–
375–399	–	–	2	–	7	21	9	5	1	9	36	19	64	2	1
350–374	–	–	–	1	2	12	6	4	1	9	27	5	20	–	4
325–349	–	–	3	–	–	12	8	8	2	3	44	16	79	–	2
300–324	–	–	–	–	2	4	3	4	2	3	19	7	39	2	–
275–299	–	–	–	–	–	8	5	–	1	1	9	3	35	–	2
250–274	–	–	–	–	–	–	3	2	–	5	10	7	26	–	3
225–249	–	–	–	–	–	–	2	1	–	3	8	1	8	–	2
200–224	–	–	–	–	–	–	–	–	–	–	2	8	7	1	1
Under 200	–	–	–	–	–	–	–	–	–	–	–	7	2	–	–
Total Male Employees	**101**	**136**	**188**	**77**	**198**	**343**	**114**	**52**	**30**	**122**	**261**	**95**	**341**	**22**	**15**

TABLE 24b

Monthly Salary Rate Frequency Distribution for Female E.D.P. Personnel, in Canada, by Occupation, July 1, 1962

Monthly Salary Rate	Number of Employees at Salary Rate														
	Project Planner	Systems Designer	Systems Analyst	Chief Programmer	Senior Programmer	Programmer	Junior Programmer	Programmer Trainee	Programmer/Operator	Senior Console Operator	Console Operator	Junior Console Operator	Peripheral Equipment Operator	Computer Maintenance Technician	Tape Librarian
$															
1,000 Plus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
975–999	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
950–974	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
925–949	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
900–924	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
875–899	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
850–874	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–
825–849	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
800–824	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
775–799	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
750–774	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–
725–749	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
700–724	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
675–699	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
650–674	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–
625–649	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–
600–624	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
575–599	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–
550–574	–	–	–	–	2	3	–	–	1	–	–	–	–	–	–
525–549	–	2	–	–	2	7	–	–	–	–	–	–	–	–	–
500–524	–	–	–	–	3	5	2	–	–	–	–	–	–	–	1
475–499	–	1	–	–	2	6	4	–	1	1	1	–	–	–	–
450–474	–	–	–	–	1	8	4	–	–	1	–	–	–	–	–
425–449	–	–	–	–	2	3	1	–	–	1	3	–	1	–	4
400–424	–	–	–	1	3	16	1	–	–	–	1	–	2	–	–
375–399	–	–	–	–	–	7	3	2	1	2	1	1	6	–	4
350–374	–	–	1	–	1	6	2	1	–	–	5	–	7	–	4
325–349	–	–	–	–	3	6	5	1	1	2	6	–	16	–	4
300–324	–	–	–	–	–	–	2	3	1	–	7	2	27	–	1
275–299	–	–	–	–	–	1	1	1	–	–	5	2	43	–	2
250–274	–	–	–	–	–	–	2	1	1	–	2	2	42	–	1
225–249	–	–	–	–	–	–	–	1	1	–	4	4	31	–	1
200–224	–	–	–	–	–	–	–	–	–	–	–	1	25	–	1
Under 200	–	–	–	–	–	–	–	–	–	–	–	–	8	–	–
Total Female Employees	–	4	4	4	20	68	27	10	7	7	35	12	208	–	23

TABLE 25

Monthly Salary Rates of E.D.P. Personnel, Male and Female, in Canada, by Occupation and Region*, July 1. 1962

Occupation	Quebec									Ontario								
	Male			Female			Total			Male			Female			Total		
	No.	Average	Range	No.	Average	Range	No.	Average	Range	No.	Average	Range	No.	Average	Range	No.	Average	Range
		$	$		$	$		$	$		$	$		$	$		$	$
Project Planner	26	847	667-1,100	–	–	–	26	847	667-1,100	58	788	567–983	–	–	–	58	788	567–983
Systems Designer	35	748	583– 855	–	–	–	35	748	583– 855	73	711	558–840	3	†	‡	76	707	558–840
Systems Analyst	62	623	535– 782	2	†	‡	64	623	535– 782	88	600	486–725	2	†	‡	90	597	477–725
Chief Programmer	23	615	500– 750	1	†	‡	24	606	433– 750	46	646	500–835	3	†	‡	49	651	500–850
Senior Programmer	45	540	417– 675	5	427	‡	50	428	375– 675	131	552	440–700	13	486	400–550	144	546	430–700
Programmer	81	481	397– 600	22	444	370–540	103	473	385– 580	207	493	367–617	38	441	347–542	245	485	362–600
Junior Programmer	29	439	350– 500	11	414	290–500	40	432	326– 500	76	421	300–546	15	380	303–459	91	414	300–535
Programmer Trainee	12	401	325– 550	3	†	‡	15	388	325– 455	37	390	303–464	7	306	‡	44	377	282–464
Programmer/Operator	7	429	‡	–	–	–	7	429	‡	11	407	312–500	4	†	‡	15	375	308–480
Senior Console Operator	28	535	397– 760	3	†	‡	31	519	375– 760	66	444	271–563	4	†	‡	70	442	271–563
Console Operator	61	394	300– 500	7	334	‡	68	387	300– 500	148	376	282–450	20	322	238–390	168	370	277–450
Junior Console Operator	28	371	277– 417	2	†	‡	30	366	277– 417	48	322	204–400	5	268	‡	53	317	204–400
Peripheral Equipment Operator	65	324	250– 400	48	267	220–340	113	300	225– 390	194	355	282–424	80	272	215–342	274	331	240–410
Tape Librarian	2	†	‡	5	325	‡	7	328	‡	10	281	233–360	15	365	325–430	25	332	250–394

Occupation	Prairie									Pacific								
	Male			Female			Total			Male			Female			Total		
	No.	Average	Range	No.	Average	Range	No.	Average	Range	No.	Average	Range	No.	Average	Range	No.	Average	Range
		$	$		$	$		$	$		$	$		$	$		$	$
Project Planner	11	785	576-1,000	–	–	–	11	785	576-1,000	6	784	‡	–	–	–	6	784	‡
Systems Designer	24	609	512– 750	1	†	‡	25	610	533– 674	4	†	‡	–	–	–	4	†	‡
Systems Analyst	32	594	450– 775	–	–	–	32	594	450– 775	6	587	‡	–	–	–	6	587	‡
Chief Programmer	4	†	‡	–	–	–	4	†	‡	3	†	‡	–	–	–	3	†	‡
Senior Programmer	14	547	400– 700	2	†	‡	16	529	400– 700	8	558	‡	–	–	–	8	558	‡
Programmer	42	494	350– 660	7	371	‡	49	476	350– 655	9	485	‡	–	†	†	10	479	410–534
Junior Programmer	8	526	‡	1	†	‡	9	505	‡	1	†	‡	–	–	–	1	†	‡
Programmer Trainee	1	†	‡	–	–	–	1	†	‡	2	†	‡	–	–	–	2	†	‡
Programmer/Operator	9	484	‡	2	†	‡	11	491	448– 570	3	†	‡	–	–	–	3	†	‡
Senior Console Operator	22	426	341– 540	–	–	–	22	426	341– 540	6	532	‡	–	–	–	6	532	‡
Console Operator	31	378	260– 450	6	324	‡	37	369	260– 450	13	413	350–450	2	†	‡	15	402	350–445
Junior Console Operator	19	307	208– 335	5	258	‡	24	297	208– 335	–	–	–	–	–	–	–	–	–
Peripheral Equipment Operator	50	316	225– 420	57	275	217–335	107	294	217– 373	22	367	260–460	22	291	260–300	44	329	260–425
Tape Librarian	1	†	‡	3	†	‡	4	†	‡	–	–	–	–	–	–	–	–	–

*The Atlantic region has been omitted because there was an insufficient number of employees to meet the criteria for publication.
†Refer to footnote 4.
‡Refer to footnote 3.

TABLE 26

Monthly Salary Rates of E.D.P. Personnel, in Canada, by Occupation and Industry, July 1, 1962

Occupation	Finance and Insurance			Manufacturing			Public Administration and Defence		
	No.	Average	Range	No.	Average	Range	No.	Average	Range
		$	$		$	$		$	$
Project Planner	21	846	600 – 1,070	44	798	563 – 985	14	789	588 – 983
Systems Designer	23	594	485 – 750	47	705	565 – 840	21	682	521 – 858
Systems Analyst	13	510	347 – 725	89	610	510 – 715	28	611	521 – 750
Chief Programmer	16	583	500 – 750	32	698	500 – 950	9	599	†
Senior Programmer	63	495	375 – 650	67	603	473 – 795	25	509	438 – 633
Programmer	77	403	325 – 498	141	528	400 – 650	56	490	362 – 685
Junior Programmer	23	316	250 – 399	67	460	369 – 560	17	410	325 – 580
Programmer Trainee	17	328	269 – 375	8	434	†	9	351	†
Programmer/Operator	5	426	†	9	391	†	9	463	†
Senior Console Operator	35	428	267 – 566	44	476	350 – 590	10	429	368 – 540
Console Operator	59	344	246 – 450	115	388	300 – 450	28	378	300 – 430
Junior Console Operator	36	288	196 – 417	25	332	225 – 400	12	331	250 – 395
Peripheral Equipment Operator	44	285	240 – 403	206	346	255 – 428	45	321	282 – 381
Computer Maintenance Technician	–	–	–	4	*	†	6	595	†
Tape Librarian	10	288	200 – 386	11	321	268 – 374	6	385	†

Occupation	Transportation, Communication and Utilities			Community and Business Services			Trade		
	No.	Average	Range	No.	Average	Range	No.	Average	Range
		$	$		$	$		$	$
Project Planner	10	783	650 – 875	3	*	†	7	828	†
Systems Designer	30	766	672 – 855	9	707	†	9	738	†
Systems Analyst	32	607	477 – 782	21	618	500 – 800	4	*	†
Chief Programmer	7	583	†	12	632	550 – 835	4	*	†
Senior Programmer	12	541	429 – 675	43	534	425 – 635	6	527	†
Programmer	68	495	407 – 542	56	453	400 – 550	11	406	347 – 500
Junior Programmer	16	475	459 – 500	15	407	347 – 475	3	*	†
Programmer Trainee	11	424	359 – 464	14	382	282 – 450	1	*	†
Programmer/Operator	1	*	†	8	401	†	3	*	†
Senior Console Operator	12	442	361 – 500	15	435	375 – 480	8	513	†
Console Operator	36	381	328 – 432	32	342	275 – 400	21	351	282 – 416
Junior Console Operator	18	376	335 – 394	9	321	†	5	347	†
Peripheral Equipment Operator	152	308	230 – 368	44	329	285 – 400	48	253	208 – 282
Computer Maintenance Technician	–	–	–	12	436	321 – 546	–	–	–
Tape Librarian	8	372	†	2	*	†	1	*	†

*Refer to footnote 4.
†Refer to footnote 3.

TABLE 27

Monthly Salary Rates of E.D.P. Personnel, by Occupation and Industry * , in Two Metropolitan Areas, July, 1962

Occupation	Total						Manufacturing			
	Montreal			Toronto			Montreal		Toronto	
	No.	Average	Range	No.	Average	Range	No.	Average	No.	Average
		$	$		$	$		$		$
Project Planner	23	839	650 – 1,167	32	803	700 – 950	10	843	13	799
Systems Designer	31	760	633 – 875	48	731	628 – 840	15	727	14	739
Systems Analyst	57	615	535 – 750	59	605	477 – 725	33	595	21	592
Chief Programmer	22	610	500 – 750	29	662	500 – 930	11	645	10	796
Senior Programmer	48	526	400 – 675	95	550	438 – 700	20	579	24	639
Programmer	97	469	385 – 562	137	491	375 – 620	36	475	37	583
Junior Programmer	38	438	350 – 500	56	418	303 – 525	22	434	26	476
Senior Console Operator	23	490	375 – 619	47	455	374 – 563	13	466	14	448
Console Operator	59	372	290 – 442	104	354	282 – 420	30	351	30	372
Junior Console Operator	27	366	285 – 417	23	332	250 – 435	6	318	5	373
Peripheral Equipment Operator	102	297	225 – 391	166	320	238 – 400	46	384	50	354

Occupation	Finance and Insurance				Community and Business Services				Transportation Communication and Utilities			
	Montreal		Toronto		Montreal		Toronto		Montreal		Toronto	
	No.	Average	No.	Average	No.	Average	No.	Average	No.	Average	No.	Average
		$		$		$		$		$		$
Project Planner	7	934	8	852	–	–	1	†	4	†	5	†
Systems Designer	1	†	7	656	–	–	5	†	14	809	16	†
Systems Analyst	–	–	7	585	2	†	18	626	22	645	4	†
Chief Programmer	7	†	5	542	2	†	5	718	2	†	4	†
Senior Programmer	13	425	34	528	4	†	27	513	10	555	–	–
Programmer	10	445	39	423	11	444	28	460	38	479	21	†
Junior Programmer	2	†	17	319	3	†	6	387	10	†	4	†
Senior Console Operator	5	531	15	450	–	–	10	421	3	†	2	†
Console Operator	14	388	22	335	3	†	21	340	9	411	13	400
Junior Console Operator	9	387	4	†	–	–	9	321	10	†	2	†
Peripheral Equipment Operator	16	271	13	294	9	†	25	341	30	301	29	350

*Public Administration and Defence, Trade, and Mining have been omitted because the number of employees was insufficient to meet the criteria for publication.
†Refer to footnote 4.

TABLE 27a

Monthly Salary Rates of Three Special E.D.P. Personnel Categories, in Two Metropolitan Areas, July 1, 1962

Occupation	Montreal			Toronto		
	No.	Average	Range	No.	Average	Range
		$	$		$	$
Programmer Trainee	11	366	325–455	22	420	347–475
Programmer/Operator	6	436	†	6	402	†
Tape Librarian	7	328	†	13	355	275–446

†Refer to footnote 3.

Programmer trainees, programmer/operators and tape librarians for the two metropolitan areas are presented in a separate table. There was not a sufficient number of them in each of the industry groups although it is possible to show total figures for Montreal and Toronto.

Footnotes

[1]For current U.S. E.D.P. salary information, see *Business Automation*, 'Annual Survey of Data Processing Salaries', June 1963, p. 22–27, July 1963, p. 18–23.

[2]All the salary information in this chapter is shown on the basis of monthly rates. Salary information supplied by respondents on the basis of weekly rates has been converted to monthly rates by applying a conversion factor of 4 1/3 weeks per month.

[3]Predominant ranges include the rates for the middle 80 per cent of the number of all employees reported in an occupation. No ranges are shown where the rates for an occupation apply to less than ten employees.

[4]Average salaries are included only where rates are available for at least five employees in the occupation distributed among at least three establishments, or for a minimum of ten employees in two establishments, provided that 80 per cent or more of the total number of employees is not reported by one of the two establishments. To obtain averages the salary rates reported in an occupation were multiplied (weighted) by the number of employees receiving each rate, the total product then being divided by the total number of employees in the occupation.

APPENDIX A

Alphabetic List of Computer Users Co-operating in the Survey

Alberta Wheat Pool, Calgary, Alta.
The Algoma Steel Corp. Ltd., Sault Ste. Marie, Ont.
Allied Chemical Canada Limited, Montreal, P.Q.
Aluminum Company of Canada Ltd., Montreal, P.Q.
Aluminum Company of Canada Ltd., Arvida, P.Q.
Aluminum Company of Canada Ltd., Kitimat, B.C.
Assurances U.C.C. Co. Mutuelle, 515 Viger St., Montreal, P.Q.
L'Assurance-Vie Desjardins, Levis, P.Q.
Atomic Energy of Canada Ltd., Chalk River, Ont.
Avon Products of Canada Limited, Pointe Claire, P.Q.
Assumption University, Essex College, Windsor, Ont.
Bell Telephone Co. of Canada, Montreal, P.Q.
Bell Telephone Co. of Canada, Toronto, Ont.
Bongard & Company, Toronto, Ont.
The British American Oil Co. Ltd., Toronto, Ont.
The British American Oil Co. Ltd., Montreal, P.Q.
The British American Oil Co. Ltd., Calgary, Alta.
B.C. Hydro & Power Authority, Vancouver, B.C.
British Columbia Telephone Company, Vancouver, B.C.
Calgary Electronic Management, Calgary, Alta.
Canada Bread Co., Toronto, Ont.
Canadair Limited, Montreal, P.Q.
The Canada Life Assurance Company, Toronto, Ont.
Canada Packers Limited, Toronto, Ont.
Canada Packers Limited, St. Boniface, Man.
Canadian Canners Limited, Hamilton, Ont.
Canadian General Electric Co. Ltd., Toronto, Ont.
The Canadian (Indemnity) Company, Winnipeg, Man.
Canadian Industries Limited, Montreal, P.Q.
Canadian Industries Limited, McMasterville, P.Q.
Canadian Ingersoll-Rand Co. Limited, Montreal, P.Q.
Canadian International Paper Company, Montreal, P.Q.
Canadian National Railways, Montreal, P.Q.
Canadian National Railways, Toronto, Ont.
Canadian National Railways, Moncton, N.B.

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Canadian National Railways, Winnipeg, Man.
Canadian National Railways, Edmonton, Alta.
Canadian Oil Companies Limited, Toronto, Ont.
Canadian Pacific Railway, Montreal, P.Q.
Canadian Pacific Railway, Vancouver, B.C.
Canadian Petrofina Limited, Montreal, P.Q.
Canadian Pratt & Whitney Aircraft Co. Ltd., Montreal, P.Q.
Canadian SKF Company Limited, Toronto, Ont.
Canadian Tire Corporation Limited, Toronto, Ont.
Canadian Underwriters Association, Toronto, Ont.
Canadian Westinghouse Co. Ltd., Hamilton, Ont.
Carleton University, Ottawa, Ont.
Chrysler Corporation of Canada Ltd., Windsor, Ont.
Computing Devices of Canada Ltd., Ottawa, Ont.
Computrex Computer Centres Ltd., Calgary, Alta.
Confederation Life Association, Toronto, Ont.
Consolidated Mining & Smelting Co. of Canada Ltd., Trail, B.C.
Crown Life Insurance Co., Toronto, Ont.
D.A.T.A. Limited, Edmonton, Alta.
Department of Agriculture, Ottawa, Ont.
Department of Finance, Ottawa, Ont.
Department of Mines & Technical Surveys, Ottawa, Ont.
D.N.D., Defence Research Medical Laboratories, Toronto, Ont.
D.N.D., Defence Research Board, Esquimalt, B.C.
D.N.D., Defence Research Board, Halifax, N.S.
D.N.D., Defence Research Board, Quebec City, P.Q.
D.N.D., Directorate of Personnel Statistics — Army, Ottawa, Ont.
D.N.D., R.C.A.F. Air Materiel Command Headquarters, Ottawa, Ont.
D.N.D., Royal Canadian Air Force, Cold Lake, Alta.
D.N.D., Radar and Communications School, Clinton, Ont.
Dept. of Public Printing & Stationery, Hull, P.Q.
Dominion Bureau of Statistics, Ottawa, Ont.
Dominion Corset Company Limited, Quebec, P.Q.
Dominion Engineering Works, Ltd., Montreal, P.Q.
Dominion Life Assurance Company, Waterloo, Ont.
Dominion Steel & Coal Corp. Ltd., Walkerville, Ont.
Dominion Tar & Chemical Co. Ltd., Montreal, P.Q.
Dupont of Canada Limited, Kingston, Ont.
Dupont of Canada Limited, Montreal, P.Q.
The E.B. Eddy Company, Hull, P.Q.
The City of Edmonton, Edmonton, Alta.
École Polytechnique, Montreal, P.Q.
Electrolux (Canada) Limited, Montreal, P.Q.
Equitable Life Insurance Company, Waterloo, Ont.
Ferranti-Packard Electric Ltd., Toronto, Ont.

Finning Tractor & Equipment Co., Vancouver, B.C.
Ford Motor Company of Canada Ltd., Windsor, Ont.
Ford Motor Company of Canada Ltd., Oakville, Ont.
Fraser Valley Milk Producers' Assoc., Vancouver, B.C.
General Motors Products of Canada, Ltd., Montreal, P.Q.
General Motors of Canada, Ltd., Oshawa, Ont.
General Steel Wares Limited, Toronto, Ont.
B.F. Goodrich Canada Limited, Kitchener, Ont.
The Goodyear Tire & Rubber Co. of Canada Limited, Toronto, Ont.
Government of the Province of Alberta, Edmonton, Alta.
Government of the Province of British Columbia, Victoria, B.C.
Government of the Province of Manitoba, Winnipeg, Man.
The Great-West Life Assurance Co., Winnipeg, Man.
Hautes Etudes Commerciales de Montréal, Montreal, P.Q.
The Hydro-Electric Power Commission of Ontario, Toronto, Ont.
Hydro-Quebec, Montreal, P.Q.
The Imperial Life Assurance Company of Canada, Toronto, Ont.
Imperial Oil Limited, Toronto, Ont.
Imperial Oil Limited, Sarnia, Ont.
Imperial Oil Limited, Calgary, Alta.
Imperial Oil Limited, Edmonton, Alta.
Imperial Tobacco Co. of Canada Ltd., Montreal, P.Q.
The Independent Order of Foresters, Toronto, Ont.
Industrial Acceptance Corporation Ltd., Montreal, P.Q.
International Business Machines, Montreal, P.Q.
International Business Machines, Ottawa, Ont.
International Business Machines, Toronto, Ont.
International Business Machines, Don Mills, Ont.
International Business Machines, Calgary, Alta.
International Business Machines, Vancouver, B.C.
International Harvester Co. of Canada Ltd., Chatham, Ont.
International Harvester Co. of Canada, Ltd., Burlington, Ont.
Interprovincial Pipe Line Company, Edmonton, Alta.
Investors Syndicate of Canada Limited, Winnipeg, Man.
Iron Ore Company of Canada, Sept-Iles, P.Q.
KCS Limited & Traffic Research Corp. Ltd., Toronto, Ont.
Kellogg Company of Canada, Limited, London, Ont.
Kelly, Douglas & Company, Limited, Vancouver, B.C.
King Merritt & Co. (Canada) Limited, Montreal, P.Q.
J.D. Lee and Company Limited, Kingston, Ont.
Ernest Leitz (Canada) Limited, Midland, Ont.
M. Loeb Limited, Ottawa, Ont.
London Life Insurance Company, London, Ont.
Loyola College, Montreal, P.Q.
MacMillan, Bloedel & Powell River Limited, Vancouver, B.C.

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Manitoba Liquor Control Commission, Winnipeg, Man.
Manufacturers Life Insurance Company, Toronto, Ont.
Massey Ferguson Limited, Toronto, Ont.
McGill University, Montreal, P.Q.
McMaster University, Hamilton, Ont.
Mead Johnson of Canada Limited, Belleville, Ont.
Medical Services Association, Vancouver, B.C.
Metropolitan Life Insurance Co., Ottawa, Ont.
Mongeau & Robert Cie Limitée, Montreal, P.Q.
Montreal Milk Producers' Co-operative, Montreal, P.Q.
Montreal Trust Company, Montreal, P.Q.
The Mutual Life Assurance Company, Waterloo, Ont.
National Cash Register, Data Processing Center, Toronto, Ont.
National Research Council, Ottawa, Ont.
A.C. Nielsen Co. of Canada Limited, Toronto, Ont.
North American Life Assurance Co., Toronto, Ont.
Northern Electric Co. Ltd., Montreal, P.Q.
Northern Electric Co. Ltd., Ottawa, Ont.
Nova Scotia Technical College, Halifax, N.S.
Office Services Unlimited, Ottawa, Ont.
Oil & Gas Conservation Board, Calgary, Alta.
Ontario Agricultural College, Guelph, Ont.
Ontario Department of Highways, Downsview, Ont.
Ontario Hospital Services Comm., Toronto, Ont.
The Workmen's Compensation Board of Ontario, Toronto, Ont.
Orenda Engines (Hawker Siddeley Canada Ltd.),Toronto, Ont.
The Oshawa Wholesale Limited, Toronto, Ont.
Outboard Marine Corporation of Canada Ltd., Peterborough, Ont.
Pan American Petroleum Corporation, Calgary, Alta.
Parke, Davis & Company Limited, Brockville, Ont.
Les Pharmacies Universelles Ltée., Montreal, P.Q.
Philips Electronics Industries Ltd., Toronto, Ont.
Physicians' Services Incorporated, Toronto, Ont.
Polymer Corporation Limited, Sarnia, Ont.
Price Brothers & Company Limited, Quebec, P.Q.
Procter & Gamble Co. of Canada Ltd., Toronto, Ont .
Provincial Transport Company, Montreal, P.Q.
The Prudential Insurance Co. of Amer., Toronto, Ont.
Pulp & Paper Research Inst. of Canada, Montreal, P.Q.
Quebec Hospital Service Association, Montreal, P.Q.
Queen's University, Kingston, Ont.
Remington Rand Limited, Toronto, Ont.
Remington Rand Limited, Montreal, P.Q.
Research Council of Alberta, Edmonton, Alberta
The Royal Bank of Canada, Montreal, P.Q.

St. Mary's University, Halifax, N.S.
Saskatchewan Gov't.-Treasury Dept., Regina, Sask.
Saskatchewan Government Ins.Office & the Saskatchewan Guarantee & Fidelity Co. Ltd., Regina, Sask.
Saskatchewan Dept. of Highways & Transportation, Regina, Sask.
Savage Shoes Limited, Preston, Ont.
Sayvette Limited, Toronto, Ont.
Shawinigan Chemicals Ltd., Montreal, P.Q.
Shell Oil Company of Canada Limited, Montreal, P.Q.
Shell Oil Company of Canada Limited, Toronto, Ont.
Shell Oil Company of Canada Limited, Calgary, Alta.
Shell Oil Company of Canada Limited, Burnaby, B.C.
The Sherwin-Williams Co., Montreal, P.Q.
The Robert Simpson Company Limited, Toronto, Ont.
Simpson-Sears Limited, Toronto, Ont.
Standard Oil Co. of British Columbia Limited, Vancouver, B.C.
The Steel Company of Canada Limited, Hamilton, Ont.
Steinberg's Limited, Montreal, P.Q.
Stock, Keith & Associates, Regina, Sask.
Sun Life Assurance Company of Canada, Montreal, P.Q.
Texaco Canada Limited, Toronto, Ont.
City of Toronto — Finance, Toronto, Ont.
Trans-Canada Air Lines, Winnipeg, Man.
Trans-Canada Air Lines, Dorval, P.Q.
Trans-Canada Pipe Lines Limited, Toronto, Ont.
United Shoe Machinery Co. of Canada Ltd., Montreal, P.Q.
University of Alberta, Edmonton, Alta.
University of Alberta, Calgary, Alta.
University of British Columbia, Vancouver, B.C.
University of Manitoba, Winnipeg, Man.
Université de Montréal, Montreal, P.Q.
University of New Brunswick, Fredericton, N.B.
University of Ottawa, Ottawa, Ont.
University of Saskatchewan, Saskatoon, Sask.
Université de Sherbrooke, Sherbrooke, P.Q.
University of Toronto, Toronto, Ont.
University of Waterloo, Waterloo, Ont.
University of Western Ontario, London, Ont.
The Western Assurance Company, Toronto, Ont.
Western Tire & Auto Supply Limited, London, Ont.
White Hardware Limited, Toronto, Ont.
Charles Wilson Ltd., Toronto, Ont.
Winnipeg General Hospital, Winnipeg, Man.
City of Winnipeg Hydro Electric System, Winnipeg, Man.
Zurich Insurance Company, Toronto, Ont.

APPENDIX B

Alphabetic List of Computer Manufacturers and Distributors Co-operating in the Survey

Burroughs Business Machines Ltd., Ottawa, Ont.
Canadian General Electric Co. Ltd., Toronto, Ont.
Computing Devices of Canada Ltd., Ottawa, Ont.
Ferranti-Packard Electric Ltd., Toronto, Ont.
Honeywell Controls Ltd., Toronto, Ont.
Instronics Ltd., Stittsville, Ont.
International Business Machines Co. Ltd., Toronto, Ont.
The McBee Co. Ltd., Toronto, Ont.
National Cash Register Company, Toronto, Ont.
Remington Rand Ltd., Toronto, Ont.

APPENDIX C

CANADA

DEPARTMENT OF LABOUR
Economics and Research Branch

In Confidence

SURVEY OF THE CURRENT STATUS OF ELECTRONIC DATA PROCESSING IN CANADA

Please report as at July 1, 1962 unless otherwise indicated.

A. 1. Name of firm, organization or institution

2. Address

3. Nature of Business
(principal product(s) and/or service(s))

4. Where convenient and applicable, please describe an appropriate measure(s) of output and indicate output for the most recent fiscal period. (e.g., dollar volume of sales, number of insurance policies in force, etc.)

.....

.....

INFORMATION ON EMPLOYMENT

B. 1. Total number of employees of firm, organization, or institution.

M	F	Total

2. Number of clerical employees of firm, organization, or institution.

M	F	Total

Note: Clerical employees: include clerical supervisory; accounting; computing and statistical; posting, checking, and maintaining records, sorting, routing and filing; stenographic, secretarial, typing and routine correspondence; keyboard and keypunch operating; tabulating and related machine operating; electronic data processing occupations, up to and including the programming level.

3. Estimate total number of clerical employees directly affected as a result of the installation of electronic data processing (e.g., change of work, transferred, retrained, terminated, or promoted).

M	F	Total

DESCRIPTION OF EQUIPMENT

C. 1. Computer manufacturer — Model — Date Installed

2. Is E.D.P. equipment leased. — Monthly rental charge

3. Is E.D.P. equipment owned. — Total cost of E.D.P. equipment

4. List peripheral equipment used in connection with computer.

5. What percentage of your total programming to date has been accomplished on the basis of:

(a) machine language programming ☐ % (b) assembly-type programming ☐ % (c) compiler-type programming ☐ %

= 100%

COMPUTER UTILIZATION

D. 1. What percentage of total computer time is used:

(a) in commercial or business data processing ☐ %

(b) in regular or repeated scientific or engineering applications ☐ %

(c) in one time applications ☐ %

(d) in programme testing ☐ %

(e) in scheduled maintenance ☐ %

(f) in unscheduled down-time ☐ %

(g) by other users ☐ %

(h) idle time ☐ %

(i) other..... (Please specify) ☐ %

100 %

Continued on page 2.

LER 80-02

D. 2. Please list computer applications

	Percentage of computer production time	Estimated programming time (in man-hours) involved in getting the programme on-the-air
(a) Commercial or Business Data Processing Applications		
1. _____	☐ %	☐ hrs.
2. _____	☐ %	☐ hrs.
3. _____	☐ %	☐ hrs.
4. _____	☐ %	☐ hrs.
5. _____	☐ %	☐ hrs.
		Total ☐
(b) Regular or Repeated Scientific or Engineering Applications		
1. _____	☐ %	☐ hrs.
2. _____	☐ %	☐ hrs.
3. _____	☐ %	☐ hrs.
4. _____	☐ %	☐ hrs.
5. _____	☐ %	☐ hrs.
		Total ☐
(c) One-time Computer Applications		
1. _____	☐ %	☐ hrs.
2. _____	☐ %	☐ hrs.
3. _____	☐ %	☐ hrs.
4. _____	☐ %	☐ hrs.
5. _____	☐ %	☐ hrs.
		Total ☐
		Grand Total ☐

100%

(Note: Please use page four to list additional applications.)

3. Average number of hours per week computer is used by your organization ☐

N.B. Include production, program testing, and unscheduled down time. Exclude scheduled maintenance and work for or by outside users.

4. Number of other firms or organizations using computer ☐ Average number of hours per week ☐

5. Average number of days per week computer is in use ☐

6. Is computer operated on regular day shift ☐ day shift plus regular overtime ☐ two shifts ☐ three shifts ☐

Continued on page 3.

COMPUTER PERSONNEL

E. 1. Number of personnel employed full time in computer and computer related work:
Note: Exclude personnel in questions two and three below.

	Male	Female	Total
(a) administrators or supervisors			
(b) project planners, systems designers, systems analysts			
(c) programmers			
(d) console operators			
(e) peripheral equipment operators			
(f) tape librarians			
(g) keypunch, verifier, data typing, communications and related machine operators			
(h) receptionists, secretaries, stenographers, typists, messengers, etc.			
(i) Other full-time computer personnel 1.			
2.			
3.			
(Please list job titles) TOTAL			

2. Approximately how many clerical personnel - data origination, data control, and co-ordinating clerks - are involved full time in preparing input for the computer or in checking, policing and distributing computer output.
Note: Data origination clerk includes personnel, either in computer center or Computer Department or in operating departments whose full time work is the preparation of computer input.

Male	Female	Total

3. How many computer engineers and computer maintenance technicians are engaged in servicing your installation ☐ N.B. Please calculate in terms of full time positions required to service your installation

Are they your own employees ☐ or employees of the computer manufacturer ☐

4. Approximately how many additional personnel are involved part time in computer and computer related work.

	Male	Female	Total
(a) Intra-Organizational Personnel			
Professional, scientific, engineering and technical			
Keypunch, tabulating and other machine operators			
Clerical			
Other			
(Please describe) SUB-TOTAL			
(b) Extra-Organizational Personnel			
Clerical			
Other			
(Please describe) SUB-TOTAL			
TOTAL			

Continued on page 4.

E. 5. Please indicate extent of any actual shortages of E. D. P. personnel required to meet current management approved objectives:

(a) administrators and supervisors	
(b) project planners, systems designers, systems analysts	
(c) computer numerical analysts	
(d) programmers	
(e) console operators	
(f) peripheral equipment operators and ancilliary personnel	
(g) maintenance technicians	
(h) other: (1)	
(2)	
(3)	
(Please describe) TOTAL	

Note: Please attach on a separate sheet suggestions which you feel might improve the supply, recruitment, training or utilization of E. D. P. manpower.

Date..... Signature.....

Official Title .....

APPENDIX D

DEPARTMENT OF LABOUR
Economics and Research Branch

CANADA

In Confidence

SURVEY OF SALARY RATES OF SELECTED ELECTRONIC DATA PROCESSING OCCUPATIONS

Information should be based on the last normal pay period preceding July 1, 1962 - round off figures to nearest dollar.

OCCUPATION	Number of Employees and Weekly or Monthly Salary Rates
INCLUDE - Only full-time, fully qualified employees whose main duties correspond closely to the job description on this form.	INCLUDE - Straight-time weekly or monthly rates. Bi-weekly or semi-monthly rates should be converted to weekly or monthly rates.
EXCLUDE - Probationary, part-time and temporary employees.	- As many rates as you pay, showing the number of employees at each rate.
- Employees in occupations not listed.	EXCLUDE - Retroactive salary adjustments made on or after July 1.
	- Overtime premium payments.
	- Averages and ranges of rates.

SYSTEMS DESIGN AND PROGRAMMING

1. Project Planner (01X068505)

With a view to planning a more efficient system to attain organizational goals, and with a knowledge of current work procedures, evaluates the capacities and capabilities of various types of E. D. P. equipment and prepares a 'feasibility study' to assess the merits of introducing, modifying or adding such equipment; responsible for the broad layout of such new system and general plan for conversion to the new system.

Male (1)						Female (2)			
No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
	$		$		$		$		$

2. Systems Designer (02X068506)

Responsible for the whole or segments of the planning and design of new work flow patterns and procedures which will meet the logical requirements of the computer system and effectively exploit the computer's capacities and capabilities; responsible for the design of procedures to convert from current work routines to computer-oriented work flow patterns; may design input and output formats, reports for management decision-making, etc.; may supervise work of one or more systems analysts.

No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
	$		$		$		$		$

3. Systems Analyst (03X069985)

Analyzes, defines and brings into appropriate sequential computer-oriented relationship the detailed problems and procedural steps involved in a segment or segments of the new work flow system; performs similar detailed analysis and planning for conversion from current procedures to the new work flow system; prepares written and/or flow charted instructions from which programmers prepare detailed flow charts and machine language instructions.

No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
	$		$		$		$		$

Continued on page 2.

OCCUPATION	Number of Employees and Weekly or Monthly Salary Rates									
	Male (1)						Female (2)			
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
		$		$		$		$		$

4. Chief Programmer (04X069981)

Plans, schedules, and supervises the preparation of programming operations: assigns, outlines and coordinates the work of other programmers; may be responsible for programming very complex problems; may review and integrate work of subordinate programmers into final, complete programs; may develop program procedures to increase operating efficiency; may be responsible for training new programmers.

5. Senior Programmer (05X069981)

Prepares detailed specifications for complex and moderately complex programs: develops flow charts and block diagrams; may code machine instructions; responsible for testing and debugging completed programs; may analyze problem and divide work into specific programming assignments; may supervise and instruct other programmers.

No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
	$		$		$		$		$

6. Programmer (06X069981)

Prepares detailed instructions for complete programs or program blocks within larger, more complex programs: develops flow charts and block diagrams; may code machine instructions; responsible for testing and debugging own programs.

No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
	$		$		$		$		$

7. Junior Programmer (07X069981)

Carries out, under supervision, less complex programming assignments: prepares flow charts and block diagrams; usually codes own programs, and may assist in coding more senior programmers' work; tests and debugs own programs, often with assistance from more experienced programmers.

No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
	$		$		$		$		$

8. Programmer Trainee (08X069981)

Receives formal classroom and on-the-job training on the capacity and capabilities of computers, the logic of computer systems, flow charting, block diagramming, coding, etc.; solves practice programming problems and performs simple programming assignments under close supervision.

No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
	$		$		$		$		$

9. Programmer/Operator (09X069982)

Prepares detailed instructions according to which data may be converted to and processed by the computer: usually responsible for coding own programs; tests and debugs own program; monitors and controls the computer in operation.

No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
	$		$		$		$		$

PRODUCTION

1. Senior Console Operator (10X12517X)

Supervises operation of the computer system; responsible for salvaging production in stop and error situations; may be responsible for scheduling work of Computer Center and maintaining appropriate records; may supervise work of other console operators and computer center personnel; may act as shift supervisor; may operate computer console on production runs and programme testing; may work with programmers in overcoming program problems; may work with maintenance personnel in identification of machine failures.

No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
	$		$		$		$		$

Continued on page 3.

3.

OCCUPATION	Number of Employees and Weekly or Monthly Salary Rates									
	Male (1)						Female (2)			
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
2. Console Operator (11X12517X) According to instruction sheets provided by programmers, controls and monitors operation of computer by manipulation of computer console: responsible for decision making and action in stop and error situations; may mount and dismount tapes on tape drives.		$		$		$		$		$
3. Junior Console Operator (12X12517X) Receives classroom and on-the-job instruction on the capacity and capabilities, logic and operation of the computer: operates computer under supervision; usually mount and dismount tapes on tape drives.		$		$		$		$		$
4. Peripheral Equipment Operator (13X12560X) Operates and/or monitors one or more components of on- or off-line auxiliary equipment, including card-to-tape converter, tape-to-card converter, card reader, card punch, high speed printer, etc.		$		$		$		$		$
TECHNICAL MAINTENANCE										
1. Computer Maintenance Technician (14X583444) Tests, adjusts, repairs and maintains the electronic computer and auxiliary equipment: diagnoses and rectifies causes of breakdown or defective performance; performs regular preventive maintenance routines.		$		$		$		$		$
OTHER										
1. Tape Librarian (15X12004X) Maintains files of reels of magnetic tapes used in E. D. P. system: classifies, catalogues, and issues input and blank tapes; maintains appropriate charge-out records; receives, inspects, carries out necessary physical maintenance, and stores returned tapes.		$		$		$		$		$

APPENDIX E

Suggestions Submitted for the Improvement of the Supply, Recruitment, Training and Utilization of E.D.P. Personnel by the Director of a Government E.D.P. Installation

A shortage of technically-trained operators and professionally-qualified personnel exists nationally and in the federal service in particular. With respect to operators in electronic data processing, the preference is for senior matriculants who have excelled in maths and physics, with or without previous job experience. A favourable development in some commercial and high schools, is the establishment of courses to acquaint students with the fundamental principles of punch card and data processing equipment.

The demand for professionally-competent specialists will continue to out-run the supply. The chief factor in attracting personnel in this group is salary levels, which at the moment, are below salaries paid for comparable work in business and industry.

Until such time that salary levels are brought into line with those outside the service and until the career status is firmly established and recruiting standards maintained by the authorities, retaining personnel of professional calibre will be difficult. Advance technology requires an increasingly higher level of academic standing and technical competence, which again will affect the supply.

Much of today's training is acquired as a result of retraining through on-the-job programs in conjunction with specific training arranged with the machine manufacturers. Key personnel connected with most programs or installations acquire additional training at non-government sponsored courses which are adequate to meet the new requirements. It is apparent that the present approach is inadequate to meet current demands.

There is a need for more training programs in business and industry on a nation-wide scale. Individual government departments should conduct more training but they lack the trained staff. The Civil Service Commission could fill this need by conducting data processing courses to augment the supply and to maintain reasonable levels of competence.

Another serious shortcoming is that systems analysts, within and outside the data processing area are too frequently overlooked, not only in the planning and developmental stages of new programs but also in plans for advanced training which is necessary in order to keep abreast of changing requirements and new concepts. In the establishment of any machine program, the integrated approach should be taken at the outset by senior administrators, including professional specialists and systems analysts. This implies a broad understanding of the needs and potentials of automatic equipment, accurate knowledge of the operations and methods and comprehensive plans for adjustment, installation and control. Systems personnel can make a greater contribution throughout the data processing area of operations.

Sufficient experience and knowledge is available with which to make decisions on the best methods of recruiting and selection of applicants without the need to throw out too wide a net which can only result in many disappointments. Selection boards should have at least one or more specialists in E.D.P. or systems who could more effectively provide the kind of guidance necessary for improved selection. The lack of weight given to the presence of responsible specialists on selection boards often leads to mediocrity in standard operations and of greater importance, unexplored machine potential.

Technicians as well as specialists are sometimes used ineffectively. This may be a result of poorly planned programs, lack of co-ordination or inadequate control procedures. Whatever the cause, it stifles initiative and promotes untimely movement within and movement out of the service. It is recognized that recruiting and training of intellectuals for larger computer establishments is greater at the onset than later on when the program is installed. Until such time as more capable people are available, those in higher paid positions will be required to work below the desired or intended level of skill and ability.